Preservative-treated timber
This Tanzania Standard was published under the authority of the Board of Directors of Tanzania Bureau of Standards on …………….

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The Building and Construction Divisional Standards Committee, under whose supervision this Tanzania Standard was prepared, consists of representatives from the following organizations:

- Ministry of Works, Transportation and Communication (MoWTC)
- National Housing and Building Research Agency (NHBRA)
- Commission for Science and Technology (COSTECH)
- Tanzania National Service (JKT HQ)
- National Estates and Designing Consultants Company Ltd (NEDCO)
- University of Dar es Salaam (College of Engineering and Technology)
- Engineers Registration Board (ERB)
- National Construction Council (NCC)
- National Housing Corporation (NHC)
- Contractors Registration Board (CRB)
- Institute of Engineers Tanzania (IET)
- Architects and Quantity Surveyors Registration Board (AQRB)

The organizations marked with an asterisk (*) in the above list together with the following were directly represented on the Technical Committee entrusted with the preparation of this Tanzania Standard.

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Introduction

The purpose of this Tanzania Standard is to set nationally accepted levels of preservative treatment of timber for a classified range of hazard conditions, and thus to promote and extend the use of timber and to conserve the raw material.

All timber, when exposed under certain conditions, is subject to attack by wood-destroying organisms, the more common destructive organisms being fungi, wood-destroying insects, marine borers and bacteria.

This Tanzania Standard does not imply that only preservative-treated timber should be used. Preservative treatment may not be necessary in applications subject to a low hazard of attack by destructive organisms or in which heartwood of a highly durable species is used (the sapwood of trees normally being non-durable). However, where such treatment is obligatory the requirements of this Tanzania Standard shall apply, irrespective of the inherent durability of the heartwood of certain timbers.

Users of this Tanzania Standard should note that essentially only properties in respect of preservative treatment are covered. Conversion of any kind after preservative treatment will reduce the expected service life of preservative-treated timber. Because of this, and because of the possibility of its having been unsuitably stored or transported, preservative-treated timber marked in accordance with clause 5 of this Tanzania Standard cannot be assumed to comply with all the relevant requirements at any time other than the time of dispatch from the factory at which it was preservative-treated. Furthermore, timber that has been reshaped or worked in any way after preservative treatment, may not be referred to as preservative-treated timber in accordance with this Tanzania Standard, unless additional preservative treatment has been applied.
National Foreword

The Tanzania Bureau of Standards is the statutory national standards body for Tanzania, established under standards Act No. 3 of 1975, amended by Act No. 1 of 1977 and then Act No. 3 was replaced by the Act No. 2 of 2009.

This draft Tanzania Standard was prepared by BCDC 6 Sawn timber, Sawn logs and Wood based Components Technical Committee, under the supervision of the Building and Construction Divisional Committee (BCDC).

In the preparation of this Tanzania Standard, assistance was derived from:


In reporting the results of a test made in accordance with this Tanzania Standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with TZS 4 (see clause 2).
1 Scope

1.1 This Tanzania Standard specifies treatment requirements (other than the method of treatment) for preservative-treated timber and timber product that have a predicted service life at various levels of preservative treatment which are considered to be acceptable for a range of hazard conditions.

1.2 This Tanzania Standard is not applicable to treatment with fire retardants or to treatments aimed at improving the physical properties of timber and timber products, nor does it cover the inherent quality of timber or timber products, or properties other than in respect of preservative treatment.

NOTE 1: Assessment of compliance with the requirements of 4.1, 4.3, 4.4 (in the cases of class C and class W preservatives), 4.6 (except where quantitative analysis has been agreed upon) and 4.7 requires special agreement between the supplier and the purchaser.

NOTE 2: Where class W preservatives have been used, previous grading of timber in respect of moisture content, splits, checks, warp, dimensions and finish may be invalidated.

NOTE 3 This Tanzania Standard should be read in conjunction with TZS 661.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Tanzania Standard:

TZS 4: 2009, Rounding off numerical values

TZS 661, Copper/chromium/arsenic composition for preservation of timber – Methods of timber treatment

TZS 258, Timber – Sampling method and general requirements for physical and mechanical tests

3 Definitions

For the purposes of this Tanzania Standard the definitions given in TZS 657:2001 and the following definitions apply:

3.1 Acceptable

Acceptable to the authority administering this Tanzania Standard, or to the parties concluding the purchase contract, as relevant.

3.2 Cylindrical rail

A pole manufactured with a smooth finish and a uniform diameter at both ends or throughout the length of the pole

3.3 Garden edging

Joined or individual pieces of sawn timber of cross dimensions at least 25 mm x 75 mm, or round timber of top diameter 30 mm to 100 mm and of length 200 mm to 800 mm, normally

1 Purchasers should, where so desired, clearly define such properties, preferably by reference to existing product specification
used as borders in gardens

3.4 General purpose pole
A debarked round pole, where no visual and strength requirements are required.

3.5 Half round
One of the halves obtained by sawing a pole longitudinally along a diameter

3.6 Hazard class
A class in a classification of the conditions of use of timber that is based on the probability of attack by wood-destroying organisms and is numbered from 0 to 6, in ascending order of probability of attack

3.7 Laths
Round timber of lengths 3.0 m to 4.5 m and top diameters 10 mm to 32 mm

3.8 Rail bearer
A round pole, or cylindrically turned pole, with holes drilled on the face to accommodate cylindrical rails

3.9 Slabbed pole
A pole that has been so machined that it has one or more flat faces that run parallel to the longitudinal axis of the pole along the entire length of the pole

3.10 Solid penetration
Presence of preservative (where relevant, as indicated by an acceptable chemical test) in all or in a specified portion (as relevant) of the sapwood, to an extent that causes complete colouration of that area of the sapwood

3.11 Stake
Sawn timber of maximum cross dimensions 38 mm x 38 mm or round timber that has a top diameter not exceeding 50 mm, intended for use as supports in agricultural applications such as tomato, and banana stakes

3.12 Timber
Sawn or otherwise processed wooden products, other than composite board products and timber products.

4 Requirements
4.1 General
Preservative-treated timber shall have been treated in accordance with TZS 661.

4.2 Sapwood
The minimum amount of sapwood present, determined in accordance with 6.3, shall be such as to achieve the minimum average net retention as specified in column 6 of tables 1, 2 or 3.

4.3 Moisture content
4.3.1 Before preservative treatment
Immediately before the preservative treatment of timber, the average moisture content of the timber, determined in accordance with 6.2, shall not exceed the appropriate maximum value recommended in TZS 661, except for the following specified round timber products, i.e.
general purpose poles, laths, garden edging, half-rounds, cylindrical rails, rail bearers, slabbied poles and stakes, which shall not, before preservative treatment, exceed the following:

a) If the units are to be treated with a class W, type WCCA or WCuAz preservative: 300 g/kg;
b) If the units are to be treated with a class C preservative: 300 g/kg;
c) If the units are to be treated with a class O preservative: 250 g/kg; and

NOTE: The wetting of a piece of timber during treatment with a class W preservative reduces the strength properties of the timber. The normal working stresses assigned to a specific grade are, however, not affected, although the use of wet timber in a load-bearing application can, because of creep, lead to excessive deflection.

4.3.2 After preservative treatment
The average moisture content of timber treated with a class C or class O preservative, determined in accordance with 6.2 shall not exceed the appropriate maximum value recommended in TZS 661, except for the round timber products specified in 4.3.1, which shall not exceed the value given in 4.3.1 (b) and 4.3.1 (c).

4.4 Preservative
The type of preservative used shall be one of those given in column 5 of tables 1, 2 or 3, as required (see annex A: A1), appropriate to the hazard class and the end use (see columns 1 and 4).

Single-purpose preservatives (insecticides) are catered for in hazard class HO-i and HO-it.

4.5 Penetration of preservative
4.5.1 Penetration of heartwood
The depth of penetration of preservative into heartwood that appears on the surface of preservative-treated timber, including that exposed by checks and splits, unless otherwise required (see annex A: A1), shall be at least 0.5 mm.

NOTE: Deeper penetration of heartwood should be specified only if based on the known penetrability of the timber in question (see annex E).

4.5.2 Penetration of sapwood
The depth of penetration of preservative into sapwood that appears on the surface of preservative-treated timber shall be as given in column 7 of tables 1, 2 or 3.

4.6 Retention of preservative
The sapwood, oxide retention of preservative in each charge of a lot of preservative-treated timber, determined in accordance with 6.4, shall comply with the appropriate values given in column 6 of tables 1, 2 or 3.

4.7 Water repellent
When so required (see annex A: A.1), an acceptable water repellent shall be added to a class W or class O preservative. When timber treated with the water-repellent preservative is tested in accordance with 6.5, the short-term repellency shall be at least 60 %.

NOTE: Because of the variable properties of water repellents, results do not necessarily relate to the long-term performance of water-repellent-treated timber under all conditions of use.
5 Marking

5.1 General

Preservative-treated timber shall bear the following information legibly and indelibly marked, and applied in accordance with 5.2 and 5.3, as relevant:

a) Number and date of this document.

b) Name of preservative

c) The treater's identification, consisting of the name or the trade name or the trademark of the preservation plant that undertook the treatment.

d) The symbol of the hazard class of the treated timber, in accordance with tables 1 and 2, e.g. H4, but in the case of timber treated in accordance with the requirements given in table 3, the symbol Y3 in addition to the hazard class, i.e. H4Y3;

e) When relevant, in addition to the symbol HO, the letter "i" for insects excluding termites, or "it" for insects including termites; and

f) Penetration class NP1 to NP6.

g) Retention.

5.2 Position of marking

5.2.1 Stress-graded structural timber

Each piece of stress-graded structural timber shall be marked on the end or face, following the rules, if relevant, given in 5.3.

5.2.2 Laths, stakes and garden edging

In every bundle of laths and loose garden edging and joined garden edging, one piece shall be permanently marked on one end using an acceptable method (acceptable methods are given in annex B).

Table 1 – Requirements of preservative-treated softwood with a service life of at least 20 years

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Exposure class</th>
<th>Timber application</th>
<th>End use</th>
<th>Type of preservative</th>
<th>Minimum average net retention kg/m³</th>
<th>Minimum penetration of preservative mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H6</td>
<td>Marine</td>
<td>Timber constantly or periodically in contact with estuarine or sea water and subject to marine borer attack</td>
<td>Piling; Retaining walls, Slipways, Groynes, Jetties, Walkways</td>
<td>CCA plus Creosote</td>
<td>24 plus 200</td>
<td>Complete sapwoodb</td>
</tr>
<tr>
<td>H5</td>
<td>Fresh water</td>
<td>Timber constantly or periodically in contact with fresh water or heavy wet</td>
<td>Piling; Retaining walls, Slipways, Culverts, Groynes, Flood gates</td>
<td>CCA or WCUAz or Creosote</td>
<td>16 or 4 or 130</td>
<td>Complete sapwoodb</td>
</tr>
</tbody>
</table>

25
<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Exposure class</th>
<th>Timber application</th>
<th>End use</th>
<th>Type of preservative</th>
<th>Minimum average net retention kg/m³</th>
<th>Minimum penetration of preservative mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4</td>
<td>Ground contact</td>
<td>Timber in direct contact with the ground</td>
<td>Sawn rectangular posts, Landscaping structures, Playground structures, Building, Fencing, Pergolas; Car Flower boxes, Decking, Bridges; Rail bearers</td>
<td>CCA or WCUAz or Creosote</td>
<td>12 or 4 or 100</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Complete sapwood or 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>H3</td>
<td>Exterior above ground</td>
<td>Timber not in contact with the ground but exposed to leaching and weathering</td>
<td>Balustrades, Fencing bearers slats, Outdoor decking beams, Garden furniture, Laminated beams, Weather board, Steps; Cladding Stairs; Gates, Fascia boards, Plywood, Sawn droppers, Slabbed poles, Cylindrical rails, Half-rounds</td>
<td>CCA or WCUAz or Creosote</td>
<td>8 or 1.4 or 80</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>H2</td>
<td>Internal</td>
<td>Timber used under a roof, not in contact with</td>
<td>Laminated beams, Roof trusses, Structural timber, Ceiling boards</td>
<td>CCA or WCUAz or Creosote</td>
<td>6 or 1.2 or 5</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard class</td>
<td>Exposure class</td>
<td>Timber application</td>
<td>End use</td>
<td>Type of preservative</td>
<td>Minimum average net retention kg/m³</td>
<td>Minimum penetration of preservative mm</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>---------</td>
<td>---------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>HO-i d</td>
<td>Dry interior</td>
<td>Timber used under a roof, not in contact with the ground, exposed to insects other than termites, and not exposed to fungal attack or leaching and weathering</td>
<td>Flooring Panellin Doors Cupboards Skirting Window frames Plywoo General purpose Machin poles for log</td>
<td>Creosote</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>HO-itd</td>
<td>Dry interior</td>
<td>Timber used under roof, not in contact with the ground, exposed to insects including termites, and not exposed to fungal attack or leaching and weathering</td>
<td>Mouldings Ceiling Floor boards Joinery</td>
<td>Deltamethrin</td>
<td>0.003</td>
<td>Complete sapwood</td>
</tr>
</tbody>
</table>

a) Preferably in roundwood form with complete envelope of sapwood, but if sawn timber is used, a large amount of sapwood shall be present.

b) To achieve the required retention, a large proportion of sapwood needs to be present.

c) Timber selected for 100 % sapwood.

d) The end uses for this hazard class, unlike the other hazard classes, are restricted to those given in column 4 only. Only products included in column 4 shall be allowed to be treated.
Notes:- 1. All retentions stated in column 6 are expressed as total volume retentions
2. CCA retentions stated in column 6 are expressed as net dry salt retentions

Table 2 – Requirements of preservative-treated hardwood with a service life of at least 20 years

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Exposure class</th>
<th>Timber application</th>
<th>End use</th>
<th>Type of preservative</th>
<th>Minimum average net retention kg/m³</th>
<th>Minimum penetration of preservative mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H6</td>
<td>Marine</td>
<td>Timber constantly or periodically in contact with estuarine or sea water and subject to marine borer attack</td>
<td>Piling; Retaining walls; Slipways; Groynes; Jetties; Walkways</td>
<td>CCA or Creosote</td>
<td>24 or 200</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td>H5</td>
<td>Fresh water</td>
<td>Timber constantly or periodically in contact with fresh water or heavy wet soils</td>
<td>Piling; Retaining walls; Slipways; Culverts; Groynes; Flood gates; Jetties; Drains; Walkways</td>
<td>CCA or WCuAz or Creosote</td>
<td>16 or 5.4 or 130</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td>H4</td>
<td>Ground contact</td>
<td>Timber in direct contact with the ground</td>
<td>Sawn rectangular posts; Landscaping structures; Playground structures; Building; Fencing; Pergolas; Car ports; Flower boxes; Decking; Bridges; Rail bearers</td>
<td>CCA or WCuAz or Creosote</td>
<td>12 or 5.4 or 100</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>General purpose poles</td>
<td></td>
<td></td>
<td>Complete sapwood or 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Piling</td>
<td>See hazard class H5</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Notes:
- 1. All retentions stated in column 6 are expressed as total volume retentions
- 2. CCA retentions stated in column 6 are expressed as net dry salt retentions
<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Exposure class</th>
<th>Timber application</th>
<th>End use</th>
<th>Type of preservative</th>
<th>Minimum average net retention kg/m³</th>
<th>Minimum penetration of preservative mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3</td>
<td>Exterior above ground</td>
<td>Timber not in contact with the ground but exposed to leaching and weathering</td>
<td>Balustrades, Fencing bearers slats, Outdoor decking beams, Garden furniture, Laminated beams, Weather board, Steps; Cladding Stairs; Gates Fascia boards, Plywood, Sawn droppers, Slabbed poles, Cylindrical rails, Half-rounds</td>
<td>CCA or WCuAz or Creosote</td>
<td>8 or 80</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>General purpose poles, Machined poles for log homes</td>
<td>WCuAz</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Laths</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>Internal</td>
<td>Timber used under a roof, not in contact with the ground and not exposed to leaching and weathering</td>
<td>Laminated beams, Roof trusses, Structural timber, Ceiling boards, Flooring, Panelling, Doors, Cupboards, Skirting, Window frames, Plywood</td>
<td>CCA or WCuAz or Creosote</td>
<td>6 or 1.5 or 1.5</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>General purpose poles, Machined poles for log homes</td>
<td>Complete sapwood</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mouldings, Ceilings, Flooring boards, Joinery</td>
<td>Deltamethrin</td>
<td>0.003</td>
<td>Complete sapwood</td>
</tr>
<tr>
<td>H0-10</td>
<td>Dry interior</td>
<td>Timber used under a roof, not in contact with the ground, exposed to insects other than termites, and not exposed to fungal attack or leaching and weathering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard class</td>
<td>Exposure class</td>
<td>Timber application</td>
<td>End use</td>
<td>Type of preservative</td>
<td>Minimum average net retention kg/m³</td>
<td>Minimum penetration of preservative mm</td>
</tr>
<tr>
<td>--------------</td>
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<td>--------------------</td>
<td>--------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>HO-it³</td>
<td>Dry interior</td>
<td>Timber used under roof, not in contact with the ground, exposed to insects including termites, and not exposed to fungal attack or leaching and weathering</td>
<td>Mouldings Ceiling Floor boards Joinery</td>
<td>Deltamethrin</td>
<td>0.01</td>
<td>Complete sapwood</td>
</tr>
</tbody>
</table>

a) The only hardwoods recommended are species with a permeable heartwood. Sawn eucalyptus species are not suitable for hazard classes H6, H5 and H4.
b) Preferably in roundwood form with complete envelope of sapwood, but if sawn timber is used, a large amount of sapwood shall be present.
c) Timber selected for 100% sapwood.
d) Type WCCA preservatives shall not be used for the treatment of sawn droppers.
e) The treatment of half-rounds with class W preservatives is not recommended.
f) Machined in such a way that the sapwood required for penetration is not disturbed.
g) The end uses for this hazard class, unlike the other hazard classes, are restricted to those given in column 4 only. Only products included in column 4 shall be allowed to be treated.

Notes:
1. All retentions stated in column 6 are expressed as total volume retentions.
2. CCA retentions stated in column 6 are expressed as net dry salt retentions.

5.2.3 General purpose poles, cylindrical rails, half-rounds, rail bearers and slabbod poles

The end or face of each unit shall be permanently marked using an acceptable method (acceptable methods are given in annex B). Where face marking is used, the mark shall be at the appropriate position, i.e. mid-length and recessed.

5.2.4 All other sawn timber products

Each piece of preservative-treated timber or in the case of a package of units or a bundle of pieces (e.g. brandering, battens and flooring strips), the package or bundle and at least one piece in the package or bundle shall be marked, following the rules, if relevant, given in 5.3.

5.3 Rules to be observed in marking

The following rules shall be observed when marking is undertaken by means of inked stamps timber complies:

a) If the timber complies with the Tanzania Standard, it shall be with the tbs mark of quality in it. If the timber does not comply with a Tanzania Standard, the country of origin and the standard it complies shall be marked;
b) Whenever possible, other markings shall not be obliterated;
Pieces containing glue lines shall not be marked as suitable for hazard classes H6, H5, H4 and H3, unless the adhesive that was used is of class 1 [Exposed (intermittently or constantly) to water, or constantly to open air]; and

c) Pieces that have been reshaped in any way after preservative treatment (the obtaining of test specimens in accordance with 6.2 and 6.3 by means other than cross-cutting shall not be regarded as reshaping) shall not be remarked as in 5.1, unless

1) An acceptable additional treatment has been applied, or

2) Compliance of the reshaped piece with the appropriate requirement of this Tanzania Standard for penetration of preservative has been established.

Table 3 – Requirements of preservative-treated softwood and hardwood products with a service life of at least 3 years

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Exposure class</th>
<th>Timber application</th>
<th>End use</th>
<th>Type of retention</th>
<th>Average preservative penetration net kg/m³</th>
<th>Minimum preservative penetration mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4</td>
<td>Ground contact</td>
<td>Timber in direct contact</td>
<td>Stakes</td>
<td>Sawn garden timber</td>
<td>or Round contact with edging</td>
<td>Creosote</td>
</tr>
</tbody>
</table>

Notes:-
1. All retentions stated in column 6 are expressed as total volume retentions.
2. CCA retentions stated in column 6 are expressed as net dry salt retentions.

6 Inspection and methods of test

Examine each piece in the sample taken in accordance with annex C for compliance with the relevant requirements of clauses 4 and 5.

6.1 Test specimens

Where relevant, use all the pieces or units taken in accordance with C.2.2 (see annex C) for assessment of compliance with the applicable requirements of clause 4 in accordance with the appropriate methods given in 6.2 to 6.5 (inclusive).

6.2 Moisture content

6.2.1 General

Prepare test specimens in accordance with TZS 258, and then use the appropriate of the methods given in 6.2.2 or 6.2.3 to determine the moisture content of each specimen to the nearest 10 g/kg.

6.2.2 Untreated units
In the case of untreated timber, use the oven-dry method given in TZS 661 or use the electric moisture-meter method given in TZS 661.

6.2.3 Treated units

In the case of units treated with a class C preservative, use the extraction method given in annex F or in the case of units treated with a class A preservative, use the electric moisture meter method given in TZS 661.

6.3 Penetration of preservative and presence of sapwood

Use annex G, or in the case of borate treatment, use annex H.

6.4 Retention of preservative

6.4.1 Unless 6.4.2 is applicable, determine the average net retention of preservative:

a) By the sample method given in annex I, or

b) By the weighbridge method given in annex J (see also note to clause 1), or

c) Provided that the volume of preservative required to treat the charge in terms of the standard can be gauged to within 1 %, by the volume method given in annex K, or

d) When borate was used, by using annex L

The average net retention is determined by using the volume of the timber in a charge. The average volumes for general purpose poles, laths, round stakes and garden edging is given in annex D.

NOTE: The individual net retention is assessable only in cases where the sample method of determining average net retention is used.

6.4.2 Determination of the average net retention of preservative by quantitative analysis of test specimens can be used but only when this and the methods of sampling and test to be used, have been agreed upon between the supplier and the purchaser (see A.2).

NOTE: Each load in a charge may be considered as a separate charge, provided that the average net retention for each load is determined

6.5 Determination of water repellency

Use annex M to determine the short-term water repellency to liquid water of timber treated with a class W or class A preservative containing a water repellent.
Notes to purchasers

A.1 The following requirements shall be specified in tender invitations and in each order or contract:

a) The hazard class, the end use, and the class or type (or both) of the preservative(s) (see 4.4).

b) The depth of penetration of heartwood if other than as specified (see 4.5.1); and

c) When relevant, that a water repellent be added (see 4.7).

A.2 The following can be agreed upon between the supplier and the purchaser:

The use of quantitative analysis to assess average net retention of preservative, and the methods of sampling and test to be used (see 6.4.2).
Annex B
(Informative)

Marking methods

B.1 Mild steel and aluminium identification tags

B.1.1 All tags should be of diameter at least 25 mm. The mild steel tag should be of thickness at least 0.5 mm and should be galvanized. The aluminium tag should be of thickness at least 0.9 mm.

B.1.2 Each tag should be attached by means of a skirt of thickness at least 5 mm or a galvanized nail of length at least 30 mm and diameter at least 2.5 mm. Nails should have a galvanizing thickness of at least 25μm.

B.1.3 Letters and figures should be of height at least 3.5 mm.

B.2 Branding

The letter height, after branding, should be at least 8 mm, with the branding width and depth at least 1 mm.
Annex C
(Normative)

Quality verification of preservative-treated timber and assessment of compliance

C.1 Quality verification

C.1.1 When a purchaser requires ongoing verification of the quality of the preservative-treated timber, it is suggested that, instead of concentrating solely on the evaluation of the final product, he also direct his attention to the manufacturer’s quality system.

C.1.2 If no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of a lot, and a purchaser wishes to establish, by inspection and testing of samples of the final product, whether a lot (as defined in C.2.1.2) of the product complies with the standard, use the sampling plan given in C.2.2. It must be noted that such a sampling plan applies to the final product only.

C.2 Assessment of compliance with the standard

NOTE: See note to clause 1. It is not possible to establish compliance with all the requirements of this Tanzania Standard in the case of lots (consignments) for which no acceptable treatment records were kept by the treater.

C.2.1 Definitions

C.2.1.1 defective

a piece, or charge of preservative-treated timber, that fails in one or more respects to comply with the relevant requirements of the standard

C.2.1.2 lot

not less than 10 and not more than 10,000 pieces or units of preservative-treated timber of the same species (or species group), nominal cross-sectional dimensions and hazard class and impregnated with the same type of preservative from one manufacturer, submitted at anyone time for inspection and testing

C.2.2 Sampling

The following sampling procedure shall be applied in determining whether a lot complies with the relevant requirements of the standard. The sample so drawn shall be deemed to represent the lot. After checking the lot for compliance with the requirements of clause 5, draw from it at random the number of pieces or units of preservative-treated timber given in column 2 of table C.1, relative to the appropriate lot size given in column 1.
Table C.1 – Lot size, sample size, and acceptance numbers for preservative-treated timber

<table>
<thead>
<tr>
<th>Lot size, pieces or units*</th>
<th>Sample size, pieces or units*</th>
<th>Acceptance number for Penetration</th>
<th>Other properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 25</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26 – 50</td>
<td>8</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>51 – 90</td>
<td>13</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>91 – 150</td>
<td>20</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>151 – 280</td>
<td>32</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>281 – 500</td>
<td>50</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>501 – 1200</td>
<td>80</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>1201 – 3200</td>
<td>125</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>3201 – 10 000</td>
<td>200</td>
<td>14</td>
<td>21</td>
</tr>
</tbody>
</table>

* The term "units" includes, for example, mosaic flooring panels.

C.2.3 Criteria of compliance

A lot shall be deemed to comply with the relevant requirements of the standard if, on inspection and testing of the sample taken in accordance with C.2.2, the numbers of defectives found do not exceed the appropriate acceptance numbers given in columns 3 and 4 of table C.1.

NOTE: See also note 1 to clause 1.
Annex D

(Informative)

Average volumes of general purpose poles, laths, stakes and garden edging

The volumes for general purpose poles, laths, round stakes and round garden edging are given to assist in the calculation of retention requirements.

NOTE: The volumes for softwood and hardwood general purpose poles, laths, stakes and garden edging are calculated on the average of the actual diameter of the class, e.g. 50 mm to 79,999 mm, and a taper of 7 mm/m.

D.1 General purpose poles

Tables D.1 and D.2 give the average volume of softwood and hardwood general purpose poles respectively.

Table D.1 – Average volumes of softwood general purpose poles

<table>
<thead>
<tr>
<th>Nominal length m</th>
<th>Volume m³</th>
<th>Top (thin end) diameter class, 20 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>50 to 79</td>
</tr>
<tr>
<td>1.2</td>
<td>0.0045</td>
<td>0.0084</td>
</tr>
<tr>
<td>1.5</td>
<td>0.0058</td>
<td>0.0107</td>
</tr>
<tr>
<td>1.8</td>
<td>0.0072</td>
<td>0.0131</td>
</tr>
<tr>
<td>2.0</td>
<td>0.0081</td>
<td>0.0148</td>
</tr>
<tr>
<td>2.1</td>
<td>0.0086</td>
<td>0.0156</td>
</tr>
<tr>
<td>2.4</td>
<td>0.0102</td>
<td>0.0183</td>
</tr>
<tr>
<td>2.7</td>
<td>0.0118</td>
<td>0.0210</td>
</tr>
<tr>
<td>3.0</td>
<td>0.0134</td>
<td>0.0238</td>
</tr>
<tr>
<td>3.6</td>
<td>0.0170</td>
<td>0.0298</td>
</tr>
<tr>
<td>3.9</td>
<td>0.0189</td>
<td>0.0329</td>
</tr>
<tr>
<td>4.2</td>
<td>0.0210</td>
<td>0.0362</td>
</tr>
<tr>
<td>4.8</td>
<td>0.0252</td>
<td>0.0430</td>
</tr>
<tr>
<td>5.4</td>
<td>0.0299</td>
<td>0.0503</td>
</tr>
<tr>
<td>6.0</td>
<td>0.0349</td>
<td>0.0581</td>
</tr>
<tr>
<td>6.6</td>
<td>0.0402</td>
<td>0.0663</td>
</tr>
</tbody>
</table>
The average volume of a half-round is half the appropriate value given in the table.

### Table D.2 – Average volume of hardwood general purpose poles

| Nominal length m | Volume |  |  |  |  |  |  |
|------------------|--------|---|---|---|---|---|
|                  | Top (thin end) diameter class, 25 mm | 50 to 74 | 75 to 99 | 100 to 124 | 125 to 149 | 150 to 174 | 175 to 199 |
| 1.2              | 0.0042 | 0.0079 | 0.0128 | 0.0189 | 0.0262 | 0.0346 |
| 1.5              | 0.0054 | 0.0101 | 0.0163 | 0.0240 | 0.0332 | 0.0438 |
| 1.8              | 0.0067 | 0.0124 | 0.0200 | 0.0292 | 0.0403 | 0.0531 |
| 2.0              | 0.0076 | 0.0140 | 0.0224 | 0.0328 | 0.0451 | 0.0594 |
| 2.1              | 0.0080 | 0.0148 | 0.0237 | 0.0346 | 0.0476 | 0.0626 |
| 2.4              | 0.0095 | 0.0173 | 0.0276 | 0.0401 | 0.0551 | 0.0723 |
| 2.7              | 0.0110 | 0.0199 | 0.0315 | 0.0458 | 0.0627 | 0.0823 |
| 3.0              | 0.0126 | 0.0226 | 0.0356 | 0.0516 | 0.0705 | 0.0924 |
| 3.6              | 0.0159 | 0.0283 | 0.0442 | 0.0637 | 0.0867 | 0.1132 |
| 3.9              | 0.0178 | 0.0313 | 0.0487 | 0.0700 | 0.0950 | 0.1239 |
| 4.2              | 0.0197 | 0.0345 | 0.0534 | 0.0764 | 0.1036 | 0.349 |
| 4.8              | 0.0237 | 0.0410 | 0.0630 | 0.0898 | 0.1212 | 0.1573 |
| 5.4              | 0.0281 | 0.0480 | 0.0732 | 0.1037 | 0.1396 | 0.1807 |
| 6.0              | 0.0329 | 0.0555 | 0.0840 | 0.1184 | 0.1587 | 0.2049 |
| 6.6              | 0.0380 | 0.0634 | 0.0953 | 0.1337 | 0.1786 | 0.2299 |

*The average volume of a half-round is half the appropriate value given in the table.*
The average volume of a half-round is half the appropriate value given in the table.

D.2 Laths and round stakes

Table D.3 gives the average volumes of softwood and hardwood laths and round stakes.

<table>
<thead>
<tr>
<th>Nominal length m</th>
<th>10 to 19</th>
<th>20 to 31</th>
<th>32 to 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>0.00027</td>
<td>0.00066</td>
<td>0.00156</td>
</tr>
<tr>
<td>2.0</td>
<td>0.00076</td>
<td>0.00166</td>
<td>0.00362</td>
</tr>
<tr>
<td>3.0</td>
<td>0.0153</td>
<td>0.00305</td>
<td>0.00625</td>
</tr>
<tr>
<td>3.6</td>
<td>0.00215</td>
<td>0.00410</td>
<td>0.00812</td>
</tr>
<tr>
<td>4.5</td>
<td>0.00334</td>
<td>0.00601</td>
<td>0.01138</td>
</tr>
</tbody>
</table>

D.3 Garden edging

D.3.1 Joined round garden edging
The average volume of joined garden edging is given in table 0.4.
Table D.4 – Average volume of joined round garden edging

<table>
<thead>
<tr>
<th>Height mm</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average volume per metre $\text{m}^3$</td>
<td>Top (thin end) diameter class $\text{mm}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30 to 49</td>
<td>50 to 79</td>
</tr>
<tr>
<td>200</td>
<td></td>
<td>0.0064</td>
<td>0.0104</td>
<td>0.0144</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td>0.0096</td>
<td>0.0156</td>
<td>0.0216</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>0.0128</td>
<td>0.0208</td>
<td>0.0288</td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>0.0160</td>
<td>0.0260</td>
<td>0.0360</td>
</tr>
<tr>
<td>600</td>
<td></td>
<td>0.0192</td>
<td>0.0312</td>
<td>0.0432</td>
</tr>
<tr>
<td>800</td>
<td></td>
<td>0.0256</td>
<td>0.0416</td>
<td>0.5760</td>
</tr>
</tbody>
</table>

*The average volume of half-round garden edging is half the appropriate value given in the table.*

D.3.2 Loose round garden edging

Calculate the approximate volume of loose garden edging in a packed container using the following formula:

$$v = 0.8 \ (l \times b \times h)$$

where

- $v$ is the volume of the contents in the container, in cubic metres;
- $l$ is the length of the container, in metres;
- $b$ is the width of the container, in metres; and
- $h$ is the height of the container, in metres.
Annex E

(Informative)

Penetration classes showing penetration requirements and corresponding analytical zones for retention measurements

<table>
<thead>
<tr>
<th>Penetration class</th>
<th>Penetration requirements b</th>
<th>Analytical zone</th>
<th>Stylized illustration of penetration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP1</td>
<td>None</td>
<td>3 mm lateral</td>
<td><img src="https://example.com/diagram1.png" alt="Diagram" /></td>
</tr>
<tr>
<td>NP2</td>
<td>Minimum 3 mm lateral into the sapwood</td>
<td>3 mm lateral into sapwood</td>
<td><img src="https://example.com/diagram2.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If it is impossible to distinguish between sapwood and heartwood</td>
</tr>
<tr>
<td>NP3</td>
<td>Minimum 6 mm lateral into the sapwood</td>
<td>6 mm lateral into sapwood</td>
<td><img src="https://example.com/diagram3.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If it is impossible to distinguish between sapwood and heartwood</td>
</tr>
<tr>
<td>NP4*</td>
<td>Minimum 25 mm lateral</td>
<td>25 mm lateral into sapwood</td>
<td><img src="https://example.com/diagram4.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sapwood depth &gt; 25 mm</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Penetration class</th>
<th>Penetration requirements$^b$</th>
<th>Analytical zone</th>
<th>Stylized illustration of penetration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP5</td>
<td>Full sapwood</td>
<td>Full sapwood$^c$</td>
<td><img src="image1.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If it is impossible to distinguish between sapwood and heartwood.</td>
</tr>
<tr>
<td>NP6</td>
<td>Full sapwood and min 6 mm into exposed heartwood</td>
<td>Full sapwood and 6 mm into exposed heartwood</td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Only if heartwood is present.</td>
</tr>
</tbody>
</table>

Key (for figures)

- ―—— boundary between sapwood and heartwood when it can be distinguished.
- - - - - boundary between sapwood and heartwood when it cannot be distinguished.

$^a$ Applies to round wood of resistant species only.

$^b$ The ability to meet the requirements of a penetration class will depend on the treatability of the timber concerned. It should be recognised that it will not be possible to achieve certain penetration requirements with certain timbers and with some, special measures may be required to achieve the target penetrations (e.g. insetting, special drying schedules, dip-diffusion). Experience indicates this to be the case for NP5 and NP6 treatments of spruce (Picea spp.).

$^c$ If it is impossible to distinguish between sapwood and heartwood the penetration requirement and the analytical zone have to be assumed to be the sapwood depth specified for the respective penetration class.
Annex F
(Normative)

Moisture content of timber (extraction method)

F.1 Apparatus and material

F.1.1 Cotton wool
Cotton wool dried in an oven at 102 ± 3 °C and stored in a desiccator.

F.1.2 Extraction thimble
An extraction thimble of suitable material (cellulose, stainless steel gauze, or brass gauze) of height approximately 65 mm and diameter to fit into the Soxhlet extractor (1.4(b)).

F.1.3 Heating mantle
A thermostatically controlled heating mantle.

F.1.4 Soxhlet apparatus
An apparatus consisting of the following items fitted with ground glass joints with which the items may be interconnected:

a) Condenser
b) Extractor
c) Flask. A round-bottom flask of 500 ml capacity.
d) Water trap. A 10 mL Dean and Stark water trap, suitably graduated.

F.1.5 Water-saturated toluol/xylol
prepared as follows: Add a few mL of distilled water to technical or commercial toluol/xylol, shake, separate the excess water after settlement by decanting, and then distill by means of a Liebig condenser. Discard the first milky distillate and collect the clear distillate for the test.

F.2 Test specimen
F.2.1 A test specimen obtained in accordance with the relevant method described in TZS 257

F.3 Procedure

F.3.1 Transfer the test specimen (F.2.1) quantitatively to the extraction thimble (F.1.2) as rapidly as possible to prevent loss of moisture, close the top of the thimble with a plug of the cotton wool (F.1.1), and place the thimble in the extractor (F.1.4(b)). Measure 200 mL of the water-saturated toluol/xylol (F.1.5) into the round-bottom flask (F.1.4(c)) and assemble the apparatus as shown in figure 1.

F.3.2 Heat the flask using the heating mantle (1.3) and continue refluxing until all the water has been driven over into the water trap (1.4(d)) and all the preservative has been extracted from the test specimen (2.1).

F.3.3 Working through the top of the condenser (1.4(a)), free any condensed water from the inner walls of the condenser and the top of the water trap by means of a wire spiral and a small volume of the toluol/xylol (1.5). Allow the apparatus to cool to room temperature, and record the volume of water collected in the trap.
F.3.4 Remove the extraction thimble from the Soxhlet extractor and dry in an oven at 102 ± 3 °C until all the toluol/xylol has been driven off and constant mass is attained. Remove the extracted test specimen from the thimble, reweigh the latter together with the cotton wool plug, and obtain (by difference) the mass of the extracted specimen.

F.4 Results

Calculate the moisture content of the test specimen as follows:

\[
\text{Moisture content, g/kg} = \frac{m_1}{m_2} \times 1000
\]

where

- \( m_1 \) = mass of water, g
- \( g \) = volume of water collected, ml
- \( m_2 \) = mass of dry extracted specimen, g

F.5 Report

F.5.1 Include the following in the report:

a) The name of the laboratory (when relevant) and the date of testing;

b) A complete identification of the test material;

c) When relevant, an outline of the method of test used; and

d) The moisture content determined for the test specimen.
Figure 1 — Soxhlet extraction apparatus
Annex G
(Normative)

Depth of penetration of preservative and detection and depth of sapwood in timber

G.1 Test specimen

Take a test specimen (or test specimens, as relevant) from the relevant position as detailed in G.1.1 to G.1.3.

G.1.1 Round poles

Using a suitable increment borer, take at least one test specimen from each pole at a position 150 mm above the theoretical groundline (TGL), but above any knots or nodes occurring at this point. Take the test specimen(s) as follows:

a) In the case of hardwoods for which no heartwood penetration has been specified, extract a radially disposed core of length at least 35 mm; or
b) In other cases, extract a radially disposed core of length at least one-half of the diameter.

In the case of poles treated with class C preservative and where the depth of penetration can be readily observed, an immediate visual inspection (see 4.2.1) of the walls of holes (where fibres are severed at approximate right angles to the grain) made for the extraction of test specimens for moisture content determination (TZS 258) is permissible instead of taking test specimens as described in (a) or (b) above.

G.1.2 Sawn or laminated timber of nominal thickness exceeding 76 mm

Using a suitable increment borer, take at least one test specimen each for heartwood penetration and for sapwood penetration at a position at least 300 mm away from an end and where the maximum sapwood thickness or the least heartwood penetration, as relevant, can be expected. Take the test specimen(s) as follows:

Extract a core that is vertical to the appropriate surface of the piece and that is of a length that exceeds the requirement for penetration depth by at least 50 %.

G.1.3 Other timber

Take as the test specimen a defect-free cross-section that is at least 300 mm away from an end or, for short pieces, that is at the approximate mid-length point of the piece.

G.2 Procedure

G.2.1 Detection of sapwood

The detection of sapwood in the specimen is based on visible colour differences between sapwood and heartwood. Where such differentiation is not readily visible, sapwood is assumed to be present

a) Where complete penetration of preservative has been obtained, or
b) Where an acceptable chemical test indicates that sapwood is present.

G.2.2 Determination of depth of penetration

G.2.2.1 Visual differentiation

For each test specimen follow the rules given in G.2.2.4 to G.2.2.5 (inclusive) to determine the penetration of preservative by visually differentiating between penetrated and
unpenetrated wood. Where necessary, apply an acceptable agent that gives a characteristic colour reaction in the presence of a component of the preservative. (Where, for the purpose of assessing preservative penetration, a coloured additive has been used in the preservative, determination of penetration may be based on the presence of such additive.)

G.2.2.2 Chemical differentiation

Determine the penetration of preservative on the basis of the presence of one or more components of the preservative in the relevant part of the cross-section of a specimen of preservative-treated timber.

G.2.2.3 Types of penetration

Consider penetration of preservative to exist
a) In the case of softwoods, where the preservative or the appropriate colour reaction (see 4.2.1) causes a complete coloration of the wood, and
b) In the case of hardwoods, where the preservative or the appropriate colour reaction causes a coloration that covers an area of extent exceeding 50 % of the area of that particular part of the wood surface; do not regard as penetrated any areas that only show ray or vessel penetration.

G.2.2.4 Assessment of penetration

Assess penetration as follows:
a) Assess immediately after the test specimen has been removed from the sample; and
b) Where, as the result of the removal of the test specimen from the timber, migration of the preservative or solvent can be expected, take the precaution of testing cross-sections of the core, or of removing an adequate layer from the surface-dry cross-section.

G.2.2.5 Methods of measuring and calculation

G.2.2.5.1 Linear measure of depth of penetration

When depth of penetration has been specified as a linear measure, take as the penetration attained in a sample the minimum value, measured to the nearest 1 mm, for all test specimens from that sample. In all cases, measure the depth from, and perpendicular to, the surface of the sample.

G.2.2.5.2 Percentage depth of penetration

When percentage depth of penetration has been specified, determine the depth of penetration for each test specimen as in G.2.2.5.1, and then calculate this depth in each case as a percentage of the depth of sapwood in that position (The depth of sapwood is determined on the basis of the linear depth of the appropriate colour observed as in G.1).

G.2.2.5.3 Percentage penetration of the cross-sectional area

When percentage penetration of the cross-sectional area has been specified, determine, to the nearest 5 %, the penetrated area as a percentage of the total cross-sectional area. When necessary, use a gridpoint system for this determination, the distance between grid centre-points being not greater than onesixth of the thickness or radius, as relevant, of the cross-section (see figure 1).

G.3 Results

G.3.1 Sapwood

Record the presence or absence of sapwood and, where relevant, the sapwood depth, in millimetres.
G.3.2 Depth of penetration

Record the depth of penetration as a linear measurement in millimetres, as a percentage depth of penetration of sapwood, or as a percentage penetration of the cross-sectional area, as relevant.

G.4 Test report

Compile the report as by including following:

a) The name of the laboratory (when relevant) and the date of testing;
b) A complete identification of the test material;
c) When relevant, an outline of the method of test used; and
d) The presence or absence of sapwood and, where relevant, the sapwood depth, in millimetres, or the linear depth of penetration, in millimetres (or both), or the linear percentage depth of penetration of sapwood, or the area percentage depth of penetration of the cross-sectional area, as relevant.

Total of grid-points : 180
Grid-points over penetrated area : 91
Grid-points over unpenetrated area : 89
Percentage penetration of cross-section : 50.5

Figure 2—Example of use of a grid-point system for determining percentage penetration
Annex H
(Normative)

Depth of penetration of borate preservatives in timber

H.1 Principle

The penetration depth of borate preservatives is determined by measuring the depth of colour change that occurs when a suitable reagent is applied to a sample of the borate preservative treated timber.

H.2 Apparatus

H.2.1 Atomizer

that provides a fine, light spray.

H.2.2 Linear measuring device,

capable of measuring to the nearest 1 mm.

H.3 Reagent

A solution that contains 0.25 g of curcumin (C_{21}H_{20}O_{6}), 10 ml of concentrated hydrochloric acid (HCl) (about 30 % (by mass)), and 10 g of salicylic acid (C_{6}H_{4}(OH)COOH) in 100 ml of ethanol (about 95 % (by volume)).

NOTES:
1 The reagent should be tested for functionality before application.
2 To extend the shelf life of the reagent, it is recommended that it be kept in a dark bottle in a fridge.

H.4 Test specimen(s)

The specified number of cores or cross-sections of the timber, obtained by the appropriate method given in annex G.

H.5 Procedure

H.5.1 Prepare each test specimen (a core or a cross-section) in accordance with the applicable method given in annex G.

H.5.2 Immediately after a test specimen has been prepared, apply the reagent (see clause 5) as a fine spray to the freshly cut surface of the test specimen and allow at least 10 min for the colour change to occur. The appearance of a red colour indicates the presence of borate preservatives in the timber.

NOTES:
1 The surface of the test specimen should be thoroughly wetted by the spray application, but should not be dripping wet. The application should not be repeated.
2 In the case of a core specimen, the specimen should be positioned horizontally when the spray is applied as the reagent might run down the specimen and spread the borate if the specimen is positioned vertically and excessive reagent is applied.
3 Care should be taken not to handle the core specimen towards the top of the core as this can cause borates to be smeared along the specimen.
H.5.3 In the case of a core specimen, measure the depth of the colour change parallel to the cylinder axis, to the nearest 1 mm. In the case of a cross-sectional specimen, measure the minimum depth of colour change perpendicular to the periphery, to the nearest 1 mm.

H.6 Result

Record the depth of penetration, in millimetres.

H.6 Test report

Include the following in the test report:

a) The name of the test laboratory (when relevant), and the date of test;
b) The identification of the test specimen;
c) Reference to this Tanzania Standard method;
d) The depth of penetration measured;
e) Whether penetration requirements were met in accordance with the relevant specifications (including details of specimens that did not comply with the required penetration);
f) Any discussion (if relevant); and
g) Conclusion (if relevant).
Annex I
(Normative)

Retention of preservative in timber (sample method)

I.1 Test specimen

I.1.1 Sample pieces

I.1.1.1 Units

From the total number of units in the charge that have the same nominal cross-sectional dimensions, or, in the case of poles, from the total number of units in the charge falling within a diameter class, take 2% of the units or four units in the case of round poles, and eight units in all other cases, whichever is the greater number of units.

I.1.1.1.2 Packages or bundles of units

Take 2% of the number of packages or bundles and take two units from each.

NOTE: Take as sample pieces only representative units
a) of the largest diameter class and longest length in the case of poles, and
b) of the longest length in other cases.

I.2 Procedure

I.2.1 Tag each sample piece so that it can be readily identified after impregnation.

I.2.2 Determine, to within 1%, the pre-impregnation mass and the actual volume of each sample piece.

I.2.3 Replace the sample pieces, distributing them proportionally among the appropriate loads, and ensuring that at least 50% of the sample pieces in each case are on top of the load. In the case of bundles or packages of units, return the pieces to the same package or bundle.

I.2.4 Impregnate the charge and redetermine the mass of each sample piece.

I.3 Results

I.3.1 From the pre-impregnation volume and the difference in mass before and after impregnation, calculate, to within 1% of the required net retention, the net retention of preservative for each sample piece, disregarding, where relevant, the quantity of solvent or non-active additive used. Take the arithmetic mean of the net retentions of all sample pieces as the average net retention of the charge or, where applicable, of a part of the charge.

I.4 Report

I.4.1 Include the following in the report:
   a) The date of determination of retention;
   b) Where relevant, the charge number;
   c) A complete identification of the treated material;
   d) The class and type of preservative;
   e) The preservative solution strength, where relevant;
   f) The pre-impregnation mass, actual volume, and post-impregnation mass of each sample piece;
   g) The net retention of preservative determined for each sample piece; and
   h) The average net retention of the charge or, where applicable of a part of the charge.
Annex J
(Normative)

Retention of preservative in timber (weighbridge method)

J.1 Procedure

J.1.1 Determine, to within 1%, the mass and the nominal volume of timber in each load in the charge before impregnation. Where a load contains products of different nominal cross-sectional dimensions or, in the case of poles of different diameter classes, determine the mass and the nominal volume separately for each group of products of the same nominal cross-sectional dimensions or diameter class or both. Impregnate the charge and, after draining, redetermine the mass of each load, or, where relevant, of each group of products, or each diameter class of poles.

J.2 Results

J.2.1 From the nominal volume and the difference in mass before and after impregnation calculate, to within 1% of the required net retention, the net retention of preservative for each load, or group of products, or diameter class of poles, as relevant, disregarding, where applicable, the quantity of solvent or non-active additive used. Take the arithmetic mean of the net retention of each load, or group of products, or diameter class of poles, in the charge as the average net retention of the charge for the particular product.

J.3 Report

J.3.1 Include the following in the report:

a) The date of determination of retention;
b) Where relevant, the charge number;
c) A complete identification of the treated material;
d) The class and type of preservative;
e) The preservative solution strength, where relevant;
f) The nominal volume, pre-impregnation mass, and post-impregnation mass of each load or product; and
h) The average net retention of the charge.
Annex K
(Normative)

Retention of preservative in timber (volume method)

K.3 Procedure

K.3.1 Ensure that the charge consists of timber products that have similar receptivity to the treatment.

K.3.2 Use a measuring tank of such diameter that 1 mm of the height of the tank corresponds to not more than 0.2 % of the volume of the preservative needed to treat a charge of timber equivalent to 30 % of the volume of the treatment vessel (taking into account, when relevant, the volume correction for difference in temperature and for loss due to evaporation).

K.3.3 If, when measuring tank readings are used, the volume of preservative needed to treat the charge cannot be gauged in accordance with 3.2, use the sample method described in annex I or the weighbridge method described in annex J.

K.3.4 Before treatment, use the nominal dimensions of the timber products in the charge to calculate the volume of the charge to within 1 %. Calculate the volume of preservative needed to treat the charge, taking into account, when relevant, the density of the preservative mixture or the strength of the solution. Record the actual indicated measuring tank reading before treatment and, based on the calculated volume, the expected reading after treatment. So impregnate the charge that the calculated volume, as gauged from the measuring tank, is retained by the charge after kick-back and, when relevant, after final vacuum.

NOTE: Before the final measuring tank reading is taken, ensure that an overflow is created from the working tank to the measuring tank.

K.3.5 Reconcile the quantity of preservative received, the quantity used, and the quantity in stock over a representative period of time.

K.4 Results

From the calculated volume of the charge and the volume of preservative retained by the charge, calculate the average net retention of the preservative, disregarding when relevant, the quantity of solvent or non-active additive used.

K.5 Test report

Include the following in the report:
a) The date of determination of retention;
b) When relevant, the charge number;
c) A complete identification of the treated material;
d) The class and type of preservative;
e) The strength of the preservative solution, when relevant;
f) The nominal volume of the charge;
g) The actual indicated reading on the measuring tank before impregnation, the expected reading after impregnation, and the calculated volume of preservative needed to treat the charge.
h) The actual indicated reading on the measuring tank after impregnation and the total volume of preservative retained by the charge; and
i) The average net retention of preservative retained by the charge.
Annex L
(Normative)

Retention of boron in timber (analytical method)

L.1 Apparatus

L.1.1 Silica crucible, of capacity 30 ml.

L.1.2 Burette, of capacity 10 mL or 50 ml.

L.1.3 Standard laboratory glassware.

L.2 Reagents

All reagents shall be of recognized analytical quality.

L.2.1 Barium hydroxide : 75 g/l

L.2.2 Hydrochloric acid : 1:1

L.2.3 Hydrochloric acid : 1:40

L.2.4 Sodium hydroxide : 100 g/l

L.2.5 0,1 N of sodium hydroxide, CO₂ free, standardized against an acceptable primary standard.

L.2.6 Mannitol (neutral).

L.2.7 Methyl red indicator, 1 g/l solution in ethanol.

L.2.8 Phenolphthalein indicator, 1 g/l solution in 50 % ethanol.

NOTE For higher boron contents (1 % to 20 %), 0,1 N to 0,25 N of sodium hydroxide can be used and the titrant delivered from a 50 ml burette.

L.3 Test specimen

From the timber to be tested, and using a fine saw to attain a smooth surface, cut two adjacent thin cross-sections of thickness about 6 mm to 13 mm, at a position at least 300 mm from the end (see also figure 1). Use one test specimen for the density determination and the other for the analysis. Dry the test specimens to 120 g/kg by air drying or by low temperature drying (< 60 °C). If timber samples contain both heartwood and sapwood, these should be analysed separately (see figure 3).

L.4 Procedure

L.4.1 Determine the density of the timber by calculating the volume of the test specimen, and then determining its mass.

L.4.2 Rasp and grind 10 g of test-specimen material until it passes through a sieve of aperture size 1,00 mm. Mix thoroughly and weigh out 5 g (accurately weighed) into the silica crucible, reserving the remainder of the material for determination of the moisture content. Using a pipette, add 15 ml of the barium hydroxide solution to the material in the crucible, and mix thoroughly to ensure thorough wetting of the wood. Place the crucible in an oven and dry at 105 °C for 2 h.
L.4.3 Transfer the crucible to a furnace heated to 200 °C and raise the temperature to 600 °C. Ignite at this temperature for 2 h. Remove the crucible from the furnace, allow it to cool, then wet the ash with a few drops of distilled water or water of equal purity. Carefully acidify the residue in the crucible with the 1:1 hydrochloric acid. It is advisable to cover the crucible with a watch-glass, sliding the latter aside slightly to allow addition of the acid. When cool, rinse the watch-glass with a few drops of distilled water into the crucible.

L.4.4 Wash the contents of the crucible through a 9 cm, No. 4, filter paper into a 500 ml Erlenmeyer flask, rinsing out the crucible with further small amounts of acid and hot water and wash the residue on the filter paper with three portions of hot water. If there is any doubt about the thoroughness of ashing, ash the filter paper and residue and repeat the acid extraction. The filtrate and washings should total about 60 mL to 100 mL. Add three drops of the methyl red indicator, neutralize with the 10 % sodium hydroxide, then acidify with the 1:40 hydrochloric acid, adding a few drops in excess. Cover the flask with a watch-glass and simmer gently for 2 min to remove carbon dioxide. Cool to room temperature and neutralize with the standard sodium hydroxide solution, using a 10 ml burette.

L.4.5 Add the mannitol (about 1 g for every 10 ml of solution) followed by 10 drops of the phenolphthalein indicator and titrate with the standard sodium hydroxide until a permanent pink colour is reached. Record the titre (T1).

L.4.6 A blank should be performed along with the determination, and its titre (T2) subtracted from that obtained in the analysis, to give a corrected titre \( T = T_1 - T_2 \).

L5 Calculations

L.5.1 The density of the timber is given by the following formula:

\[
\rho = \frac{V}{m}
\]

where

\( \rho \) is the density of the timber, in kilograms per cubic metre;
\( m \) is the mass of the test specimen, in kilograms; and
\( V \) is the volume of the test specimen, in cubic metres.

L.5.2 Weigh out ± 5 g (w1) of the ground specimen (see 5.2) on a watch-glass and dry in the oven to constant mass at 100 °C to 105 °C. Reweigh (w2). The percentage of boron \( B \) (or boric acid \( BA (H_3BO_3) \)) in the analysed sample, based on oven-dry wood, is given by the following formulae:

\[
B = \frac{(m_1)}{(m_2)} \frac{T \times N \times 1,082}{M} \times 100
\]

or

\[
B = \frac{(m_1)}{(m_2)} \frac{T \times N \times 6,184}{M} \times 100
\]

where

\( T \) is the blank-corrected titre, in millilitres;
\( N \) is the molarity of the sodium hydroxide, in moles per kilogram;
\( M \) is the mass of the air-dry wood sample, in grams;
\( m_1 \) is the mass of the air-dry ground sample, in grams; and
\( m_2 \) is the mass of the oven-dry ground sample, in grams.

**L.5.3** To convert the percentage of boric acid (BA) to kilograms of boric acid equivalent per cubic metre, use the following formula:

\[
BAE = \frac{BA \times \sigma}{100}
\]

where

\( BA \) is the boric acid equivalent retention, in kilograms per cubic metre.

**L.6 Test report**

Include the following in the test report:
- a) The name of the test laboratory, when relevant, and the date of test;
- b) Identification of the test specimen;
- c) Reference to this standard test method;
- d) Tabulated test results (including details of specimens that do not comply with the required boron retention);
- e) Discussion, when relevant; and
- f) Conclusions, when relevant.
Section 6.0 mm thick

Figure 3. Details of sampling
## Annex M

(Informative)

### Classification of timber preservatives

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<tr>
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<td>Type of preservative</td>
<td>Description</td>
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<td>CCL</td>
<td>Creosote – Lurgi-gasification process</td>
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