
**Preservation of bamboo-
Part 1: for construction purpose**

ICS:91.080.20

Published by Ethiopian Standards Agency

©ESA



Foreword

This Ethiopian Standard has been prepared by the Technical Committee for Bamboo and Bamboo Products (TC 99) and published by the Ethiopian Standards Agency (ESA).

In developing this standard reference is made to the following

- IS 9096, Preservation of bamboo for structural purpose - Code of practice, published by Indian Bureau of Standards (BIS)

This draft standard is developed in collaboration with International Bamboo and Rattan Organization (INBAR).

Acknowledgment has been made for both the organization for their contribution for the effort of national standardization.

Preservation of bamboo- Part 1: for construction purpose

1. Scope

This standard covers types of preservatives and treatment procedures of bamboo used for construction purpose including posts, scaffoldings, house buildings, fencing, ceiling, roofing, walls, trusses, bridges, purlins, skirting, etc. against bio-degrading organisms.

It does not deal with the protection of bamboo from fire and staining.

The preservation and treatment bamboo for non-construction purpose is covered in ES 6418 - part 2.

2. Normative References

ES 1950, *Structural use of timber- Code of practice for the preservative treatment of structural timber*

ES 6435, *Specification for creosote oil for use as wood preservative*

ES 6436, *Preservation of timber-Code of practice*

ES 6437, *Preservation of bamboo for non-structural purpose- Code of Practice*

ES 6438, *Specification for water soluble type wood preservative*

ES 6439, *Specification for water soluble type wood preservative - Copper-chrome-arsenic (CCA) wood preservatives*

ES 6440, *Specification for water soluble type wood preservative - Copper-chrome-Boron (CCB) wood preservatives*

ISO/DIS 21625 Terminology of bamboo and bamboo products

3. Terms and definitions

Terms and definitions stated in ES 6416 and ISO/DIS 21625 shall apply.

4. Recommended preservatives

In addition to preservatives stated in ES 6436, the following preservatives are recommended for treatment of bamboo between age three and five years.

a) Coal tar creosote- This is a fraction of coal tar distillate with a boiling point range above 200°C and is widely used admixed with fuel oil. A creosote fuel oil in the mixture in the ratio of 50:50 is found suitable. The fuel oil insures stability of creosote against evaporation and bleeding from the treated bamboo. **The creosote used shall comply with the requirements of ES 6435.**

b) Copper-chrome-arsenic composition a typical composition of this preservative comprises of copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$), arsenic pent oxide ($\text{As}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$) and sodium or potassium Dichromate ($\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ or $\text{K}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$) in proportion of 3:1:4 conforming to ES 6439

c) Acid-copper-chromate composition- A typical composition of this preservative of 1.68 parts chromic acid (Cr_2O_3) (equivalent to 2.5 parts of sodium dichromate), 50 parts of copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and 47.5 parts of sodium dichromate ($\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$) in the proportion of 1.5:3:4 conforming to ES 6438 .

d) Copper-chrome-boron composition – A typical composition of this preservative comprises of boric acid, copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and sodium or potassium Dichromate ($\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$) or ($\text{K}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$) in the proportion of 1.5:3:4 conforming to ES 6440.

e) Boric acid-borax- This has been used successfully against lyctus borers. A mixture in a ratio 1:1.5 found more suitable.

f) Copper-zinc-Naphthenate/Abieates- these are Copper and zinc salt of Naphthenic/Abietic acid.

5. Method of Treatment and drying/seasoning

5.1. treatment method

Details of the method of treatment of bamboo by hot and cold dipping process, fast fluctuating process and Boucherie process are given in ES 6436.

In addition to methods described in ES 6436, diffusion process, boiling, modified Boucherie process and steeping or butt end treatment method as applicable to the treatment of bamboo (non-structural) given in ES 6437 may also be employed.

5.2. drying/seasoning

Harvested and chemically treated bamboo should be

- air dried by stacking in upright position leaning against another bamboo or on a good support system in open air or under shade and keeping it away from direct soil contact for minimum of 4 weeks.
- dried in Vacuum/pressure process after treatment
- Kiln drying under controlled temperature and air movement in a closed chamber or drying room after treatment.

6. Choice of preservatives

The choice of preservatives and method of treatment depend up on the use to which the treated material is put.

The recommended practice with regard to preservatives, their concentration, Requisite absorption and method of treatment of bamboo are given in **table 1**.

Table 1: Recommended preservatives, their concentration and absorption and the method of treatment of bamboo used for diverse purpose.

SI No (1)	Structural use of Bamboo (2)	Recommended Preservatives (3)	Concentration of preservatives (%) (4)	Absorption of preservatives (kg/m ³) (5)	Method of treatment (6)
1	Posts, poles, fencing etc exposed to weather and in contact with ground				
	A) Dry bamboo	Coal tar creosote	-	80 -128	Hot and cold Vacuum/pressure process
		Copper-chrome	6– 8	8- 12	Vacuum/pressure process
		Acid-copper- chromate composition and Copper- chrome-boron composition	8-10	10-14	Vacuum/Pressure process
		Acid-copper- chromate composition and Copper- chrome-boron composition	8 - 10	10-12	Vacuum/pressure process
	b)Freshly cut bamboo	Copper- chrome	8 – 10	8 – 12	Diffusion, boucherie process
		Acid-copper- chromate composition and Copper- chrome-boron composition	8 - 10	10 - 14	Modified Boucherie process, Butt end treatment

TABLE 1 CONT...

SI No (1)	Structural use of Bamboo (2)	Recommended Preservatives (3)	Concentration of preservatives (%) (4)	Absorption of preservatives (kg/m ³) (5)	Method of treatment (6)	
	Scaffolding, ladders, bridges, etc. exposed to weather but not contact with ground					
	a) Dry bamboo	Coal tar creosote	-	48 – 80	Hot and cold, vacuum/pressure process	
		Acid-copper-chromate composition and Copper-chrome-boron composition	6-8	6-10	Vacuum/Pressure process	
	b) Freshly cut Bamboo	Copper- chrome	6-8	5 – 8	Vacuum/Pressure process	
		Acid-copper and Copper-chrome-boron composition	6 – 8	6 – 10	Modified Boucherie process for 6-hour and diffusion process for 20-25 days, FFP process	
	Housing, building, walls, rafters, trusses, purlins, skirting, etc. under cover					
	c) Dry bamboo	Coal tar creosote		48 – 80	Hot dipping, hot and cold Vacuum pressures process Steeping, hot and cold,	
		Acid-copper and Copper-chrome-boron composition	5	6	vacuum/pressures process	
		Boric acid-borax	4	5	Steeping, hot and cold, vacuum/pressures process	
		Copper-zinc-Naphtenate/ Abieates	5 percent as copper (for Copper Naphtenate/Abietates)		0.4 as Cu	Dipping, brushing
			6 percent as Zinc (for Zinc Naphtantite/Abietates)		0.6asZn	Dipping, brushing
	a) Freshly cut bamboo	Acid-copper-chromate composition Copper-chrome-boron composition Boric acid-borax	5	5-6	Diffusionprocess, ModitledBoucherieprocess, FFPprocess	

Table 1 cont....

SI No (1)	Structural use of Bamboo (2)	Recommended Preservatives (3)	Concentration of preservatives (%) (4)	Absorption of preservatives (kg/m ³) (5)	Method of treatment (6)
4	Ceiling, door, and door paneling				
	a) Dry bamboo	Acid-copper-chromate composition and Copper-chrome-boron composition	3	4	Steeping, hot and-cold. vacuum/pressure process
		Boric acid-borax	4	5	Steeping, hot and cold, vacuum/pressures process
		Copper-zinc-Naphtenate/A bieates	4 percent as copper (for copper Naphtenate/ A bietates)	0.4 as Cu	Dipping, brushing
			5% as zinc for zinc Naphtenate /Abietates)	0.6 as Zn	
	b) Freshly cut bamboo	Acid-copper-chromate composition, Copper-chrome-boron composition and Boric acid-borax	5	4	Diffusion process, boucherie process, FFP Process

7. Sampling for testing absorption and spread of preservatives

7.1. Representative sample for test of preservative shall be cut from the treated bamboo for purpose of chemical analysis. The weight of the sample shall be about 100g for every 100Kg of treated bamboo.

7.2. The sample obtained as in 6.1 shall be powdered either by hand file or converted into a small chip (about 10 mm long, 2 mm wide and 1 mm thick) by using a knife. The powder of chips thus prepared shall be thoroughly mixed and a liquid of 10 to 20 g taken for chemical analysis

8. Testing of preservatives in treated bamboo

Testing of preservatives in treated material shall be carried out in accordance with ES 6437.

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010. ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1998.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are in compliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government or ganizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes. Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in f rom our website.

ESA has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of ESA.

International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the International Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM). It is a founding member of the African Regional Organization for standardization (ARSO).

More Information?

Contact us at the following address.

The Head Office of ESA is at Addis Ababa.

☎ 011- 646 06 85, 011- 646 05 65

☎ 011-646 08 80

✉ 2310 Addis Ababa, Ethiopia

E-mail: info@ethiostandards.org,

Website: www.ethiostandards.org



Standard Mark

©ESA