IS 1902 (2006): Preservation of bamboo and cane for non-structural purposes - Code of practice [CED 9: Timber and Timber Stores]

BLANK PAGE

भारतीय मानक

गैर–संरचनात्मक कार्यों के लिए बाँस और बेंत का संरक्षण — रीति संहिता

(दूसरा पुनरीक्षण)

Indian Standard

PRESERVATION OF BAMBOO AND CANE FOR NON-STRUCTURAL PURPOSES — CODE OF PRACTICE

(Second Revision)

ICS 71.100.50; 79.020

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 2006

Price Group 3

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Timber and Timbers Stores Sectional Committee had been approved by the Civil Engineering Division Council.

Bamboo and cane, which occupy a prominent place in everyday life, are used in making household articles like chicks, jafri, ladders, mats, baskets, furniture, etc, but have a low natural durability (1 to 3 years) against attacks by fungi and insects. Hence preservative treatment is required to lengthen their life. They are very difficult to treat by normal preservative method in dry condition since their outer, and to some extent, inner membranes are impermeable to liquids. The treatment is, therefore, best carried out in green condition.

This standard was first published in 1961. In the first revision, boronated-copper-chrome-arsenic composition has been added as a recommended preservative while benzene hexachloride, dialdrin, chromated zinc chloride and copper-chrome-zinc-arsenic composition had been deleted. Further, capillary rise method was incorporated for preservative treatment of bamboos.

In this revision boronated-copper-chrome-arsenic has been deleted. Further, the recommended practice with regard to preservatives, their composition, absorption and methods of treatment for various non-structural use of bamboo and cane have also been redefined. In view of modification in recommended preservatives, Annex A has been modified.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PRESERVATION OF BAMBOO AND CANE FOR NON-STRUCTURAL PURPOSES — CODE OF PRACTICE

(Second Revision)

1 SCOPE

1.1 This standard covers the types of preservatives and method of treatment of bamboos and canes, used both indoor and outdoor for non-structural purposes. It also includes recommendations on the choice of treatment depending on the various uses to which the bamboo and cane are put.

1.2 This standard does not cover the treatment of bamboo meant for structural purposes, which is covered separately in IS 9096.

2 REFERENCES

The following standards contain provisions, which through references in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
218 : 1983	Specification for creosote oil for use as wood preservatives (*second revision*)
401 : 2001	Preservation of timber — Code of practice (*fourth revision*)
9096 : 2006	Code of practice for preservation of bamboo for structural purposes (*first revision*).
10013	Specification for water soluble type wood preservatives:
(Part 1) : 1981	Acid-copper-chrome (ACC) wood preservative
(Part 2) : 1981	Copper-chrome-arsenic (CCA) wood preservative
(Part 3) : 1981	Copper-chrome-boron (CCB) wood preservative

3 RECOMMENDED PRESERVATIVES

3.1 The type of preservatives for treatment of bamboo and cane-ware shall be as given in IS 401.

3.2 The following are the various preservatives recommended for treatment of bamboo and cane for non-structural purposes:

a) *Coal tar creosote* — This is a fraction of coal tar distillate with a boiling point range above 200°C and is widely used as an admixture with fuel oil. A creosote fuel oil mixture in the ratio 3 : 7 is found suitable. The fuel oil ensures stability to creosote against evaporation and leaching from the treated bamboo or cane. The creasote used shall conform to IS 218.

b) *Copper and zinc naphthenates/ abietates* — These are copper and zinc salts of Naphthenic/Abietic acids.

c) *Boric acid and borax* — These have been used successfully against lyctus borers. A mixture of both in ratio 1 : 1.5 is found more suitable.

d) *Copper-chrome-arsenic (CCA) composition* — A typical composition of this preservative comprises copper sulphate ($CuSO_4.5H_2O$), arsenic pentaoxide ($As_2O_5.2H_2O$) and sodium or potassium dichromate ($Na_2Cr_2O_7.2H_2O$ or $K_2Cr_2O_7.2H_2O$) in the proportion of 3 : 1 : 4; conforming to IS 10013 (Part 2).

e) *Acid-copper-chrome (ACC) composition* – A typical composition of this preservative comprises 1.68 parts of chromic acid (Cr_2O_3) (equivalent to 2.5 parts of sodium dichromate), 50 parts of copper sulphate ($CuSO_4.5H_2O$) and 47.5 parts of sodium dichromate ($Na_2Cr_2O_7.2H_2O$); conforming to IS 10013 (Part 1).

f) *Copper-chrome-boron (CCB) composition* — This consists of boric acid (H_3BO_3), copper sulphate ($CuSO_4.5H_2O$) and sodium or potassium dichromate ($Na_2Cr_2O_7.2H_2O$ or $K_2Cr_2O_7.2H_2O$) in the proportion of 1.5 : 3 : 4; conforming to IS 10013 (Part 3).

g) *Copper-8-quinolinate* — This is an organometallic compound with typical

composition comprising of 10 percent copper-8-quinolinate, 10 percent nickel-2-ethyl hexanoate and 80 percent inert ingredients. The preservative finds above the ground application and is suitable for sapstain and mold control. It is greenish brown in colour, odourless and toxic to both wood decay fungi and insects and have low toxicity to humans and animals.

4 METHODS OF TREATMENT

4.1 Details of treatment by surface application (brushing, dipping), soaking, hot and cold process, vacuum/pressure process, fast fluctuating pressure (FFP) process and boucherie process are given in IS 401. In addition to above, diffusion process, modified boucherie process and steeping or butt end treatment (capillary rise) method as applicable to the treatment of green bamboos and canes are given in **4.1.1**, **4.1.2** and **4.1.3**, respectively.

4.1.1 *Diffusion Process*

In this process, green bamboos and canes are kept submerged in solutions of water-soluble preservatives, when inorganic ions diffuse into the green material.

NOTE — The rate of diffusion depends upon the mobility of the ions. The penetration of the ions depends upon the moisture content of the green material, its anatomical structure, the mobility of the diffusing ions, the temperature of the solution and the period of immersion in the treating solution.

4.1.2 *Modified Boucherie Process*

A suitable container is used for keeping the treatment solution, which shall be of water-soluble type. The container is provided (at the bottom) with side tubes fitted with stop-cocks and rubber tubes to which are attached the green bamboos with branches on. In order to secure leak-proof contact between the rubber tubes and the bamboos, suitable metallic clamps or other device should be used. The tanks is also fitted with a screw cap to which is attached a motor car tyre tube valve (*see* Fig. 1). The tank is filled with the treating solution to about two-thirds of the volume and after tightening the cap, air is pumped in through the valve to a pressure of 0.1 to 0.14 N/mm^2 which could be easily measured by using a pen-gauge. Under this pressure, the treating liquid forces the sap out of the walls and septa of the bamboos through the open end and takes its (sap's) place in course of time. After a few preliminary experiments, the concentration of the treating solution and the period of treatment can be fixed to obtain requisite absorption of the preservative. The bamboo is taken off on the completion of the treatment.

Branches of treated bamboo also get treated and are therefore required to be disposed off carefully as the same will not degrade naturally and are likely to pose hazard due to presence of toxic chemicals. These should preferably be burnt in the open and ashes buried underground or be disposed off by any other suitable method.

4.1.3 *Steeping or Butt End Treatment (Capillary Rise) Method*

Green bamboo up to 1.8 m length can be treated by this method. After removing the branches, bamboos are made to stand vertically in troughs or drums containing solutions of water borne preservatives. Bottom end, up to 250 mm is kept immersed and any loss of preservative due to up-take or evaporation is made up daily. The top end is kept wet by wrapping with wet cotton cloth. Bamboo is inverted after at least 7 days. The preservative is sucked by vessels and is distributed to neighbouring cells by diffusion.

5 CHOICE OF PRESERVATIVE AND METHOD OF TREATMENT

5.1 The choice of the preservative and the method of treatment depend upon the use to which the treated material is put.

5.2 The recommended practice with regard to preservative, their concentration, requisite absorption and method of treatment of bamboos and canes for diverse purposes, is given in Table 1.

6 SAMPLES

6.1 Representative samples for testing of preservatives shall be cut from the treated cane or bamboo for the purpose of chemical analysis. The mass of the sample shall be about 50 g for cane and about 100 g for bamboos, for every 100 kg of cane or bamboo treated.

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

7 TESTING OF PRESERVATIVE IN TREATED MATERIAL

7.1 Determination of Absorption of the Preservative

The net absorption of the preservative chemicals in bamboo and cane shall be determined by chemical analysis of treated material and shall be compared with the figures obtained from the weight of the material before and after treatment, wherever possible. The final sample obtained in **6.2** shall be used for the analysis.

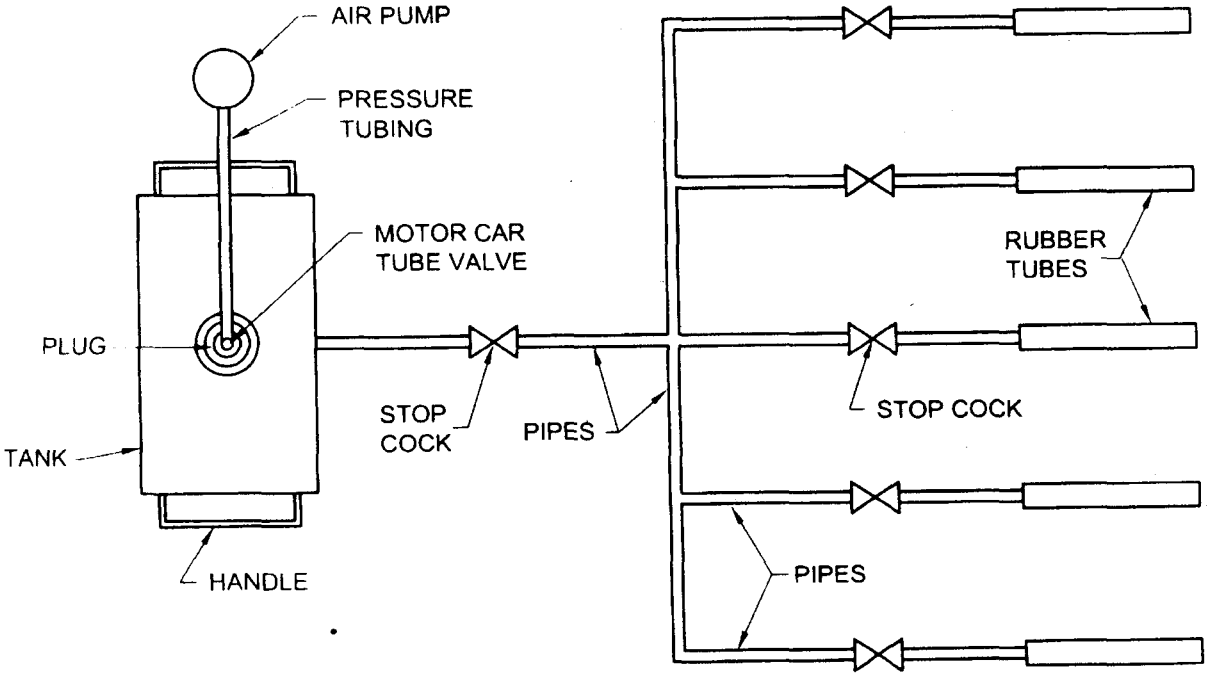

FIG. 1 SCHEMATIC DIAGRAM FOR MODIFIED BOUCHERIE PROCESS

Table 1 Recommended Preservatives, Their Concentration and Absorption, and the Method of Treatment of Bamboo and Cane Used for Diverse Purposes

(*Clause* 5.2)

Sl No.	Diverse (Non-structural) Uses of Treated Bamboo and Canes	Recommended Preservatives (*see* 3.2)	Concentration of Preservative, percent	Absorption of Preservative kg/m^3	Method of Treatment
(1)	(2)	(3)	(4)	(5)	(6)
i)	Chicks, jafri, mats exposed to weather:	d	6	5	Diffusion process, FFP process
	a) Green split bamboo (split, sliver)	e, f	8	8	Diffusion process, FFP process
	b) Dry bamboo (spilt, silver)	d	4	5	Vacuum/pressure process, steeping
		e, f	6	8	Vacuum/pressure process, steeping
		b	4 percent as copper (for copper napthanate/ abietate)	0.4 as copper	Soaking /brush
			6 percent as zinc (for zinc napthanates/ abietate)	0.6 as zinc	Soaking /brush
ii)	Furniture exposed to the weather (components):				
	a) Green bamboo (round) and cane, for legs and arms	d	4 to 6	5	Modified Boucherie process, diffusion process, FFP process
		e, f	6 to 8	8	

Table 1 (*Continued*)

Sl No.	Diverse (Non-structural) Uses of Treated Bamboo and Canes	Recommended Preservatives (*see* 3.2)	Concentration of Preservative, percent	Absorption of Preservative kg/m^3	Method of Treatment
(1)	(2)	(3)	(4)	(5)	(6)
	b) Green bamboo (spilt) and canes, for parts other than those in (a).	d	4 to 6	5	Diffusion process, FFP process, steeping
		e, f	6 to 8	8	
	c) Dry bamboo (round or split) and cane, for legs and arms	d	4 to 6	5	Vacuum/pressure process, Soaking
		e, f	6 to 8	8	
		b	4 percent as copper (for copper napthenate/ abietate)	0.4 as copper	Soaking/brush
			6 percent as zinc (for zinc napthenate/ abietate)	0.6 as zinc	
iii)	Furniture for interior (components) including chicks, mats:				
	a) Green bamboo and cane (round, split, sliver)	c, e, f	4 to 6	5	Modified Boucherie process, diffusion process, FFP process, steeping
	b) Dry bamboo and cane (round, split, sliver)	c, e, f	4	5	Steeping, vacuum/pressure process
		b	4 percent as copper (for copper napthenate/ abietate)	0.4 as copper	Soaking/brush
			6 percent as zinc (for zinc napthenate/ abietate)	0.6 as zinc	
iv)	Basketware:				
	a) Agriculture use, other than food stuff				
	Green bamboo (split, slivers)	e, f, g	4 to 6	5	Diffusion process, FFP process
	Dry bamboo (split, slivers)	e, f, g	2 to 4	5	Steeping, hot and cold, vacuum/ pressure process
		b	2 percent as copper (for copper napthenate/ abietate)	0.2 as copper	Soaking/brush
			3 percent as zinc (for zinc napthenate/ abietate)	0.3 as zinc	
		a	30 : 70	—	Hot and cold, hot soaking

Table 1 (*Concluded*)

Sl No.	Diverse (Non-structural) Uses of Treated Bamboo and Canes	Recommended Preservatives (*see* 3.2)	Concentration of Preservative, percent	Absorption of Preservative kg/m^3	Method of Treatment
(1)	(2)	(3)	(4)	(5)	(6)
	b) Food stuff, including fresh fruit, vegetables, tea-leaves, etc				
	Green bamboo (split, slivers)	c	5	4	Diffusion process, FFP process
	Dry bamboo (split, slivers)	c	5	4	Steeping, vacuum/pressure process
		g	2 percent as copper	4	Momentary dip, brush
v)	Finished/semi-finished products				
	Mats for building boards:				
	UF bonded boards	b	1		Steeping/mix in glue
	PF bonded boards	Lindane based formulations		2 kg/100 kg glue	Glue line poisoning
vi)	Handicrafts	b	1 percent (as copper/zinc)		Momentary dip

7.2 Determination of Presence of the Preservative

7.2.1 The penetration of the following preservatives in the treated bamboo and cane may be tested by the visual colour reaction method given in Annex A:

a) Copper-chrome-arsenic (CCA) composition,

b) Acid-copper-chrome (ACC) composition,

c) Copper-chrome-boron (CCB) composition, and

d) Boric acid and borax.

7.2.2 Preservatives other than those referred to in **7.2.1** do not give definite colour reactions.

ANNEX A

(*Clause* 7.2.1)

METHOD FOR THE DETERMINATION OF PRESENCE OF PRESERVATIVES BY COLOUR REACTION

A-1 COPPER-CHROME-ARSENIC COMPOSITION, ACID-COPPER-CHROME COMPOSITION AND COPPER-CHROME-BORON COMPOSITION

A-1.1 Copper

A-1.1.1 *Preparation of Reagent*

Dissolve 0.5 g of chrome azurols concentrate and 5.0 g sodium acetate in 80 ml water and dilute the solution to 100 ml.

A-1.1.2 *Test*

Spray the solution so obtained in **A-1.1.1** or dip into it, a reasonably dry boring or cross-section of the bamboo or cane to be tested.

A-1.1.3 *Reaction*

The material treated with the preservative quickly turns deep blue in colour.

A-1.2 Arsenic

A-1.2.1 *Preparation of Reagents*

A-1.2.1.1 *Solution* 1— Dissolve 3.5 g ammonium molybdate in 90 ml, distilled water, and add 9 ml cane boric acid.

A-1.2.1.2 *Solution* 2 — Dissolve 0.07 g benzidine dihydrochloride in 10 ml cane acetic acid and add the solution to 90 ml distilled water.

A-1.2.1.3 *Solution* 3 — Dissolve 30 g stannous chloride in 100 ml of 50 percent hydrochloric acid.

A-1.2.2 *Test*

First apply solution 1 on the cross-section or boring by dipping or pouring. The entire surface must be saturated. After 2 min, shake off the excess solution and allow to dry for about 1 min. Next, apply Solution 2 in the same manner as Solution 1. Apply Solution 3 by pouring the solution on a cross-section, beginning at the untreated part.

A-1.2.3 *Reaction*

The entire wood surface will immediately turn bluish. It is necessary to wait for several minutes for the reaction to bring about the maximum colour contrast.

A-2 BORIC ACID AND BORAX AND COPPER-CHROME-BORON COMPOSITION

A-2.1 Preparation of Reagents

A-2.1.1 *Alcoholic Extract of Turmeric Powder*

Reflux 2 g of turmeric powder with 100 ml of 95 percent alcohol for 1 h; cool it and filter.

A-2.1.2 *Extract of Salicylic Acid and Hydrochloric Acid*

Saturate with salicylic acid a mixture of 80 ml of distilled water and 20 ml of 30 percent hydrochloric acid.

A-2.2 Test

Apply the alcoholic extract of turmeric powder obtained in **A-2.1.1** on a reasonably dry surface of the material to be tested. Allow the surface to dry for a few minutes and then apply the extract obtained in **A-2.1.2**.

A-2.3 Reaction

The treated surface develops red colour.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. CED 9 (7212).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website :* www.bis.org.in

Regional Offices : *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110 002 — 2323 7617, 2323 3841

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Kankurgachi, KOLKATA 700 054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022 — 260 3843, 260 9285

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600 113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400 093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed at New India Printing Press, Khurja, India