SRI LANKA STANDARD 923 : PART 1 : 1991

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SPECIFICATION FOR

COPPER/CHROME/ARSENIC PRESERVATIVE TREATMENT OF WOOD POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES

PART 1 : TREATMENT PROCESSES

SRI LANKA STANDARDS INSTITUTION

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PART 1 : TREATMENT PROCESSES

SLS 923 : Part 1 : 1991

Gr.7

SRI LANKA STANDARDS INSTITUTION
53, Dharmapala Mawatha,
Colombo 3,
Sri Lanka.

DRAFTING COMMITTEE ON WOOD POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES

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SRI LANKA STANDARD

SPECIFICATION FOR COPPER/CHROME/ARSENIC PRESERVATIVE TREATMENT OF WOOD POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES

PART 1 : TREATMENT PROCESSES

FOREWORD

This Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1991.04.02, after the draft, finalized by the Drafting Committee on Wood Poles for Overhead Power and Telecommunication Lines, had been approved by the Electrical Engineering Divisional Committee.

Copper/chrome /arsenic (CCA) preservative is the most widely used preservative for wood poles throughout the world. It has also proved effective for treating a wide range of species for a variety of applications from building timbers to marine piles due to the following advantages.

a) The solvent water is readily avilable.
b) Retentions can be easily adjusted by varying the concentration of the treating solution.
c) Evaporation is negligible.
d) The preservative is odourless and non-oily.
e) Economy in freight.

This part (Part 1) of the standard specifies compositions of the preservative, the methods of application, the retentions and penetrations desired from the prescribed treatment and a method for assesing the effectiveness of the treatment.

Part 2 of this standard specifies test methods.

All values given in this specification are in SI units.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final values observed or calculated expressing the result of a test or an observation shall be rounded off in accordance with CS 102. The number of significant figures to be retained in the rounded off values shall be the same as that of the specified value in this standard.

The Sri Lanka Standards Institution gratefully acknowledges the use of relevant publications of the British Standards Institution in the preparation of this standard.

1 SCOPE

This part of the standard specifies treatment of wood poles for overhead power and telecommunication lines with water-borne wood preservatives consisting essentially of copper sulphate, sodium dichromate or potassium dichromate, and hydrated arsenic pentoxide, packed either as a mixture of dry ingredients or in the form of a paste in water. This covers the composition of the preservative, the methods of application, retention of the preservative and the assesment of the treatment.

2 REFERENCES

CS 102 Presentation of numerical values
SLS 848 Wood poles for overhead power and telecommunication lines
Part 2 Selection and preparation of poles for treatment
SLS 923 Copper/chrome/arsenic preservative treatment of wood poles for overhead power and telecommunication lines
Part 2 : Test methods

3 DEFINITIONS

For the purpose of this standard the following definitions shall apply.

3.1 gross volumetric absorption : The total volume of preservative solution absorbed into the wood, in litres of solution per cubic metre of wood, during the treating operation, as measured immediately after the release of pressure and before applying a vacuum.

3.2 net volumetric absorption : The volume of preservative solution remaining in the wood, in litres of solution per cubic metre of wood, immediately after completion of the entire cycle of treatment (excluding any drying treatment).

3.3 net dry salt retention : The average mass of dry preservative salts in the wood, in kilograms per cubic metre of timber, after the complete treatment operation.

4 REQUIREMENTS

CCA preservative to be used shall comply with the requirements specified in 4.1 and 4.2 when tested in accordance with SLS 923 : Part 2. A typical test certificate for CCA preservatives complying with this standard shall be as shown in sample certificate in Appendix A.

4.1 Compositions of preservatives

Two mixtures of slightly different composition are specified, designated as Type 1 and Type 2 respectively.

4.1.1 *Nominal compositions*
The nominal compositions are defined in Table 1, together with the permissible deviations from these compositions due to variations in the purities of the ingredients and homogenity of the mixtures.

Table 1 - Nominal compositions of active ingredients

Ingredient	Type 1		Type 2	
	Nominal	Minimum	Nominal	Minimum
Copper % m/m ($CuSO_4.5H_2O$)	32.6	29.5	35.0	31.5
Dichromate % (m/m) ($K_2Cr_2O_7$ or as $Na_2Cr_2O_7.2H_2O$)	41.0	37.0	45.0	40.5
Arsenic % (m/m) ($As_2O_5.2H_2O$)	26.4	24.0	20.0	18.0

NOTE
The sum of cumulative deviations of individual components shall be not less than 95 per cent (m/m), that is minimum values can not occur together.

4.1.2 *Actual compositions*
The preservatives may be supplied either as a mixture of dry ingredients or in the form of a paste in water.

In practice, the actual compositions of the preservatives as supplied may differ from the nominal compositions as a result of the removal or addition of water. In such cases the ratio of the active ingredients shall be in the same proportions by mass as specified in Table 1, and containers shall carry information on the mass of the preservative equivalent to unit mass of the nominal composition.

4.2 Characteristics of preservative

4.2.1 *pH value of solution*
The pH value of a 20 g/l solution of the preservative, prepared as described in Clause 4 of SLS 923 : Part 2 : 1991 shall be between 1.8 and 2.8 when determined by means of a glass electrode at ambient temperature.

4.2.2 *Insoluble matter*
The content of insoluble matter shall not be greater than 0.5 per cent by mass, when determined by the method described in Clause 5 of SLS 923 : Part 2 : 1991.

4.3 Concentration and composition of preservative solution

4.3.1 *Concentration*
The concentration of the working solution shall be at the discretion of the timber preserver but shall be such that, when it is used in conjunction with a correct treatment schedule (see 8), the specified net dry salt retention is obtained. However, the concentration of the solution shall not be less than 15 g of the nominal composition per litre.

4.3.2 *Temperature*
During preparation and application of the solution, a temperature up to 40 ^{o}C is acceptable, but the solution shall be stored at air temperature. The storage temperature shall not be allowed to rise above 40 ^{o}C.

4.3.3 *Proportions of ingredients*
The ratio of the active ingredients in the working solution shall be in the same proportion, by mass, as specified in Table 1.

4.3.4 *pH value*
The pH value of the working solution at 27^{0}C shall be not higher than 3.0 when determined by means of a glass electrode.

5 TESTS ON PRESERVATIVE AND SOLUTION

5.1 sampling of preservative
The preservative shall be sampled by the method described in Clause 4 of SLS 923 : Part 2 : 1991.

5.2 Analysis of preservative

5.2.1 *Concentration of working solution*
The concentration of the well mixed solution shall be determined by the method described in Clause 11 of SLS 923 : Part 2 : 1991. Before a solution that has been stored is used, a sample shall be taken from the bulk and the concentration again determined.

5.2.2 *Analysis of working solution*
A representative sample of not less than 1 litre of the working solution shall be taken by the procedure described in Clause 4 of SLS 923 : Part 2 : 1991, and the proportion of active ingredients determined by the methods described in Clause 6, Clause 7 and Clause 8 of SLS 923 : Part 2 : 1991.

6 METHODS OF APPLICATION

The wood poles shall be treated with an aqueous solution of the preservative by the full-cell vacuum and pressure impregnation process or by the Lowry empty-cell pressure impregnation process.

7 CONDITION AND PREPARATION OF POLES FOR TREATMENT

Condition and preparation of poles for treatment shall be in accordance with **SLS 848 : Part 2**

8 TREATMENT PROCEDURE

8.1 Selection of poles

As far as possible, only poles of similar species and permeability shall be included in any one charge. If this is not possible the treatment schedule shall be applicable to the species most resistant to penetration.

8.2 Stacking in Cylinder

The poles shall be stacked in the cylinder so that the solution will have free access to all faces of the poles.

8.3 Methods of application

8.3.1 *Full-cell process*

a) Initial vacuum

The wood poles shall be subjected to an initial vacuum by reducing the pressure in the cylinder to at least minus 80 kPa* (600 mmHg vacuum gauge reading).

b) Flooding

On the completion of the initial vacuum treatment the cylinder shall be flooded with the preservative solution before releasing the vacuum.

c) Pressure period

The wood poles shall be subjected to a hydraulic pressure varying from 1000 kPa (10 kgf/cm^2) to 1400 kPa (14 kgf/cm^2) the pressure applied being suited to the species of poles under treatment. Pressure shall be maintained until the gross volumetric absorption is obtained that will ensure the stipulated penetration and the final net dry salt retention of the preservative (see **Clause 9.2 of SLS 848 : Part 2 : 1989**). Pressure period shall be not less than 1 h. If the poles are such that there is difficulty in obtaining the desired impregnation, the pressure shall be maintained until the further absorption in each of two consecutive half-hour periods is less than 2 per cent of the total absorption up to the commencement of the first of these periods.

** 1 bar = 100 kPa*

d) Final vacuum
After the pressure period is completed, the cylinder shall be emptied of preservative and a vacuum shall be established and maintained until the net volumetric absorption is sufficient to give the specified net dry salt retention. In no case shall the vacuum exceed minus 80 kPa (600 mmHg vacuum gauge reading).

NOTE
With the full cell process the net volumetric absorption is commonly 90 per cent to 100 per cent of the gross volumetric absorption.

8.3.2 *Lowry empty-cell process*

a) Flooding
After loading, the cylinder shall be flooded with the preservative solution.

b) Pressure period
This shall be as specified in c) of 8.3.1

c) Final vacuum
If a final vacuum is applied, it shall be as specified in d) of 8.3.1.

NOTE
The Lowry empty-cell process is similar to the full-cell process, but no initial vacuum is applied. With this process, the net volumetric absorptions vary with the treatment schedules employed and a net absorption of 60 per cent of the gross volumetric absorption is regarded as typical.

8.4 Record of treatment
A treatment record shall be maintained by the wood preserver and a certificate (see Table 4 for sample certificate) shall be issued to the buyer.

9 REQUIREMENTS OF TREATMENT

9.1 Penetration
Generally the penetration of preservative into a pole shall be to the full depth of the sapwood.

With refractory species such as Eucalptus which have a wide sapwood, the penetration of preservative shall be to a depth of 25 mm or 75 per cent of sapwood thickness, whichever is the greater.

9.1.2 *Determination of penetration*
The penetration of preservative in a pole shall be ascertained by averaging the radial depth of penetration achieved in two test borings using hollow auger and extractor, taken from opposite sides of the pole in a plane from between 600 mm to 1 m above the nominal ground lines.

9.1.3 *Sampling and testing*

The sample shall consist of 10 per cent of the number of poles in the charge, subject to a minimum of 10, fraction of a pole counting as one pole. If there are less than 10 poles in the charge, every pole shall be bored. The poles shall either be selected and marked before treatment or be taken at random afterwards from reasonably accessible positions in the charge. If the borings show that the sapwood is penetrated in all the sample poles, as specified in 9.1, all the poles in the charge shall be deemed to meet the requirements of this clause.

Visual inspection shall be used for distinguishing the sapwood from the heartwood of the species as recommended in **SLS 848.**

If the sapwood of one or more of the sample poles is not penetrated as specified in 9.1, and if the number in the charge is sufficient, a further group of poles equal in number to the original sample shall be bored. If all the borings from this second sample show that the sapwood is penetrated as specified in 9.1, the remainder of the poles in the charge shall be deemed to meet the requirements of this clause.

If the second sample includes one or more poles of which the sapwood is not penetrated as specified in 9.1, the procedure shall be repeated until a group is obtained in which the sapwood of every pole is penetrated as specified in 9.1, or until every pole in the charge has been bored. Every sampled pole which is found not to have its sapwood penetrated as specified in 9.1, shall be retreated. Retreated poles shall be subjected to the same sampling and testing procedure as freshly treated poles.

9.2 **Retention of preservative** (salt retention)

The average net dry salt retention within the charge of pole shall be at least 12 kg/m^3.

The calculation of net dry salt retention shall be based on volumetric measurements of the preservative solution in the plant before and after treatment.

The calculation is as follows:

$$\text{Net dry salt retention } (kg/m^3) = \frac{\text{Net volumetric absorption } (l/m^3) \times \text{Concentration of solution } (g/l)}{1000}$$

Alternatively, if required by the customer or if it is desired to test the variation between individual poles, the calculation may be based on the difference in mass before and immediately after treatment, of samples to be mutually agreed upon by the customer and the timber preserver.

10 ASSESMENT OF THE TREATMENT

10.1 Records
Detailed records of the treatment schedule shall be made available to the customer on request, in addition to a simple form of certificate stating that the specification has been followed. Apart from these documents covering the process and the specification followed, the customer may, on request, observe the treatment of a given charge to satisfy himself that the process specification have been adhered to. (See 8.4)

10.2 Analysis
If required, the preservative retained in the treated poles may be analyzed by the method described in Clause 6, Clause 7 and Clause 8 of SLS 923 : Part 2 : 1991. It should be appreciated, however, that extensive sampling is necessary to confirm that a given charge has been treated to a specified average net dry salt retention.

11 HANDLING POLES AFTER TREATMENT

11.1 The treated poles may be safely handled after drying. In case of poles which are still wet after treatment, skin contact should be avoided and protective gloves worn.

11.2 To prevent damage to treated poles, hooks shall not be used on the side surfaces of treated poles. All handling of treated poles, with pointed tools shall be confined to the ends only. When pressure treated poles have been accidently damaged, or when it has been absolutely necessary to cut or bore into them after treatment in such a way as to expose or nearly expose the wood, such injuries, cuts or holes shall be carefully field-treated by brushing, spraying or dipping either with a 95 to 100 g/l solution of the wood preservative or with a solution having one of the compositions of active ingredients given in Table 2.

Table 2 Composition of active ingredients for after fabrication treatment solutions

Ingredient	g/l (minimum)	pH limits
Solution A		
NaF	26	
Na_2AsO_4	22	
Na_2CrO_4	37	6.0 - 8.0
4.6-dinitrophenol/ 4.6-dinitro-O-cresol mixture (1 : 1)	03	
Solution B		
$CuSO_45H_2O$	50	3.0-5.0
$Na_2Cr_2O_7.2H_2O$	56	

APPENDIX A

Table 3 - Sample test certificate for copper/chrome/arsenic preservative

Supplied by :

Tested by :

Description of tests	Results	Compliance with SLS 923 : Part 2
1.Composition of preservative		
(a) Copper	...% m/m	Yes/No
(b) Dicromate	...% m/m	Yes/No
(c) Arsenic	...% m/m	Yes/No
2.pH value	...	Yes/No
3.Content of insoluble matter	...% m/m	Yes/No
4.Concentration of the working solution	...%	Yes/No

The copper/chrome/arsenic preservative tested +complies / does not comply with SLS 923 : Part 1.

+Delete the inapplicable.

TABLE 4 - CERTIFICATE OF TREATMENT WITH CCA PRESERVATIVE

TREATED BY
TREATED AT
TREATMENT PROCESS : *LOWRY EMPTY CELL / FULL CELL*†

CLIENT :
BUYERS CONTRACT NO. : *CO/C+S/T 62/5*
OUR CONTRACT NO. : *9/88*

Date	Charge no.	NO OF POLES IN THE CHARGE 8m	9m	10m	12m	Total	Volume m^3	Moisture content %	Initial vacuum pressure* Value (kPa)	Duration (min)	Preservative pressure Value (kPa)	Duration (min)	Final vacuum pressure** Value (kPa)	Duration (min)	Volume of preservation retained by timber after treatment (l)	Concentration of the preservative solution (g/l)	Net volumetric absorption (l/m^3)	Net dry salt retention (kg/m^3)	Tested poles	Accepted poles Total
89.03.05	1	21	40	22	18	101	25.75	22	91.4	60	1379	60	74.7	30				117	11	101
89.03.06	2	15	20	30	40	105	26.80	23	91.4	60	1379	60	74.7	30				115	11	105
89.03.07	3	26	35	20	29	110	25.50	21	91.4	60	1379	60	74.7	30				118	22‡‡	88‡‡
89.03.08	4	28	15	27	20	90	22.05	21	91.4	60	1379	60	74.7	30				116	10	90

* Applicable for full-cell process only

** Final vacuum may or may not be applied in the Lowry empty-cell process

† Delete the inapplicable

‡‡ Initial sample 11 of which 3 poles did not satisfy the requirements A second sample of 11 was taken and all poles satisfied the requirements Therefore all poles except 3 did not satisfy the requirements. The 3 poles not satisfying requirements could be retreated.

Manager Treatment yard

SRI LANKA STANDARDS INSTITUTION

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