SRI LANKA STANDARD 859 : PART 1 : 1989

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SPECIFICATION FOR

PRESERVATIVE TREATMENT WITH COAL TAR CREOSOTE 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 859 : Part 1 : 1989

Gr.7

SRI LANKA STANDARDS INSTITUTION
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SPECIFICATION FOR PRESERVATIVE TREATMENT WITH COAL TAR CREOSOTE OF WOOD POLES FOR OVERHEAD POWER AND TELECOMMUNICATION LINES

PART 1 : TREATMENT PROCESSES

FOREWORD

This Sri Lanka Standard was authorised for adoption and publication by the Council of the Sri Lanka Standards Institution on 1989.09.07, 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.

Decay of timber poles is caused by fungi, bacteria and insects, and can only be effectively prevented by preservative treatment. Effective preservation depends upon the preservative employed and its proper application. An efficient preservative should be poisonous to fungi, bacteria and insects, but not to persons handling it; permanent; able to penetrate sufficiently; cheap; readily available; non-corrosive to metal fastenings; and should not render the timber more flammable by its use. Creosote has most of the above requirements but it increases flammability and is subject to evaporation. Preservative treatment of wood poles by pressure impregnation with creosote is widely used and well proven.

A standard on preservative treatment of wood poles using creosote was considered opportune due to the

a) wide application of this method of treatment;
b) greater vulnerability of wood poles to decay due to favourable temperature regime in Sri Lanka for growth of fungi and bacteria, supply of moisture by ground contact, and access to termites and insects through soil contact;
c) use of timber species of lesser natural durability for better utilization of the timber resources in the country; and
d) need to adhere to acceptable values of net retention and penetration as successful timber preservation by creosoting is largely dependent on the depth of penetration of the creosote and the amount retained in the timber.

This part (Part 1) of the standard specifies requirements of creosote, the method of application, and the retention and penetration to be attained by the prescribed treatment. Part 2 of this standard specifies the 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 value, observed or calculated, expressing the result of test or observation shall be rounded off in accordance with CS 102. The number of figures to be retained in the rounded off values shall be the same as that of the specified value in this standard.

The assistance derived from publications of the British Standards Institution and Standards Association of Australia in the preparation of this standard, is gratefully acknowledged.

1 SCOPE

This part of the standard specifies processes for preservation of wood poles by pressure impregnation with creosote, and includes requirements of creosote, preparation of poles for treatment, processes of treatment, prescribed values of net retention and penetration, and handling of wood poles after treatment.

2 REFERENCES

BS 144 Coal tar creosote for the preservation of timber.
CS 102 Presentation of numerical values
SLS 848 Wood poles for overhead power and telecommunication lines.
SLS 859 Preservative treatment with coal tar creosote of wood poles for overhead power and telecommunication lines. Part 2 Test methods

3 REQUIREMENTS OF CREOSOTE

Creosote to be used shall comply with the requirements given in 3.1 to 3.7. Certificate of creosote for compliance shall comply with this standard and shall be as shown in sample certificate of Table 1.

3.1 Description

The material shall consist wholly of a blend of distillates of coal tar and shall be free from any admixture of petroleum oils or oil not derived from coal tar.

3.2 Density

The density of the material at 38^0C, when determined by the method described in 4 of SLS 859 : Part 2 : 1989, shall be not lower than 1.003 g/ml and not higher than 1.108 g/ml.

TABLE 1 - Certificate of creosote

Supplied by :

Tested by :

Description of tests	Results	*Compliance with SLS ...
1. Density at 38°C	.... g/ml	Yes / No
2. Liquidity		
(a) Becomes completely liquid at 38°C	Yes/No	Yes/No
(b) Remains completely liquid after cooling to 32°C.	Yes/No	Yes/No
(c) Remains completely liquid after standing at 32°C for 2 hours	Yes/No	Yes/No
3. Water content		
(a) Fresh sample supplied	...% by volume of water	Yes/No
(b) Sample from treatment plant	...% by volume of water	Yes/No
4. Distillation range		
a) Distillate at 205°C	...% (m/m)	Yes/No
b) Distillate at 230°C	...% (m/m)	Yes/No
c) Distillate at 315°C	...% (m/m)	Yes/No
d) Distillate at 355°C	...% (m/m)	Yes/No
5. Extractable phenol content	... ml/100g	Yes/No
6 Matter insoluble in toluene		
a) Fresh sample supplied	...% (m/m)	Yes/No
b) Sample from treatment plant	...% (m/m)	Yes/No

The creosote tested *complies/does not comply with SLS 859 : Part 1.

**Delete the inapplicable.*

3.3 Liuidity
Creosote intended for hot application, when tested by the method described in 5 of SLS 859 : Part 2 : 1989, shall become completely liquid and, after cooling to 32 ^{o}C, shall remain completely liquid after standing at that temperature for two hours.

3.4 Water content
The material in the state obtained from the supplier, when tested by the method described in 6 of SLS 859 : Part 2 : 1989, shall not yield more than 1.5 per cent by volume of water. When tested by the same method, the material in use in the treatment plant at any time shall not yield more than 3.0 per cent by volume of water.

3.5 Distillation range
When tested by the method described in 7 of SLS 859:Part 2:1989, distillates at 205^{0}C, 230^{0}C, 315^{0}C, and 355^{0}C shall be within the limits set out in Table 2.

TABLE 2 - Distillation limits

Temperature ^{o}C	Cumulative distillate	
	Not less than %(m/m)	Not more than %(m/m)
205	-	5
230	5	30
315	40	78
355	73	85

3.6 Extractable phenol content
The distillate to 315^{0}C produced from the material by the procedure described and the test method set out in 7 and 8 respectively, of SLS 859 : Part 2 : 1989, shall contain not more than 20 ml/100g of extractable phenols. Creosotes having a density at 38^{0}C lower than 1.06 g/ml shall not contain more than 5 ml/100 g of extractable phenols.

3.7 Matter insoluble in toluene
When tested by the method described in 9 of SLS 859 : Part 2 : 1989,the material in the state received from the supplier shall not contain more than 0.4 per cent (m/m) of matter insoluble in toluene. When tested by the same method, the material in use in the treatment plant at any time shall contain not more than 0.6 per cent (m/m) of matter insoluble in toluene.

4 METHODS OF APPLICATION

When poles are treated with creosote, either the Rueping or the Bethell process shall be used: of these Rueping process is preferred. Creosote shall be handled with care as required by the Appendix A.

5 SELECTION AND PREPARATION OF POLES FOR TREATMENT

Selection and preparation of wood poles for treatment shall be carried out in accordance with **SLS 848 : Part 2.**

Further, the surface of the poles to be treated shall be free from extraneous water, mud or dirt, as well as from all inner and outer bark.

The average moisture content of the seasoned poles immediately prior to treatment shall not exceed 28 per cent. Suitable methods for determining moisture content are given in **10 of, SLS 859 : Part 2 : 1989.**
All drilling,notching, cutting, boring or other fabrications and marking required shall be carried out before preservative treatment.

6 LOADING IN CYLINDERS

6.1 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.

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

7 TREATMENT

7.1 Treatment record
A treatment record shall be maintained by the wood preserver and a creosoting certificate (see Table 3 for sample certificate) shall be issued to the buyer.

TABLE 3 – CREOSOTING CERTIFICATE

CREOSOTED BY : *STATE TIMBER CORPORATION*
CREOSOTED AT : *KALDEMULLA*
TREATMENT PROCESS : ~~*RUEPING*~~ / *BETHELL*†

CLIENT : *C E B*
BUYERS CONTRACT NO : *CO/C+S/T/62/87*
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 air pressure * or Initial vacuum pressure ** Value (kPa)	Duration (min)	Creosote pressure Value (kPa)	Duration (min)	Final vacumm pressure Value (kPa)	Duration (min)	Temperature °C max	min	Net retention kg	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	84.7	30	79.4	76.6	3013	117	11	101
89 . 03 . 06	2	15	20	30	40	105	26 . 80	23	91.4	60	1379	60	84.7	30	79.4	76.6	3083	115	11	105
89 . 03 . 07	3	26	35	20	29	110	25 . 50	21	91.4	60	1379	60	84.7	30	79.4	76.6	3009	118	22 ‡	107 ‡
89 . 03 . 08	4	28	15	27	20	90	22 . 05	21	91.4	60	1379	60	84.7	30	79.4	76.6	2558	116	10	90

Manager (Treatment yard)

* Rueping process

** Bethell 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 satisfy the requirements. The 3 poles not satisfying requirements could be retreated.

7.2 Treatment using creosote

7.2.1 *Rueping process*
Poles shall be subjected to an air pressure greater than atmospheric but not exceeding 400 kPa. Pressure shall be maintained until the poles are completely immersed in the creosote, after which the pressure shall be increased sufficiently and maintained for a sufficient period to ensure that all the requirements for penetration and retention specified in 9 & 8 are met. A final vacuum shall be applied to the poles so that they are reasonably free from dripping creosote after removal from the cylinder. Temperature shall be maintained at around 80^0C.

7.2.2 *Bethell process*
Poles shall be subjected to an initial vacuum by reducing the pressure in the cylinder to at least minus 75 kPa, and the pressure shall not be allowed to rise above this figure until the poles are completely immersed in the creosote.

After the vacuum has been released, pressure of sufficient magnitude shall be applied and maintained for a sufficient period to ensure that all the requirements for penetration and retention specified in 9 & 8 are complied with. Unless otherwise specified by the purchaser, a final vacuum shall be applied so that the poles are reasonably free from dripping creosote after removal from the cylinder. Temperature shall be maintained around 80^0C.

8 NET RETENTION

The net retention is the quantity of creosote remaining in the pole after removal from the cylinder. It shall be calculated from the difference in mass before and after treatment of representative samples mutually agreed upon by the purchaser and the creosoter. It may, alternatively, be based on the volumetric measurements of the creosote in the working tank before and after treatment. If the temperature of the creosote in the measuring tank is not the same when each reading is taken, a correction shall be made, based on the assumption that creosote expands 1 per cent in volume for a rise in temperature of 15^0C. The density of creosote at 38^0C may be taken as 1.04 g/ml.

The net retention of creosote, in kilograms per cubic metre, shall be not less than 115 kg/m^3, where the calculation of the cubic content of each pole is based on the mean of the top and bottom diameters taken by a caliper. However, minimum net retention required may exceed this amount when penetration laid down in 9 is attained. It is emphasized that the figure specified refers to the average retention for a charge and does not apply to the retention of individual poles in a charge.

Because of the wide variation that can exist in the permeability of different poles of the same species it is not normally practicable to specify minimum retention in individual poles.

9 PENETRATION

9.1 Penetration requirements

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

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

9.2 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 line.

9.3 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 out for distinguishing the sapwood from the heartwood of the species recommended for wood poles 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.

Any new borings shall be at a cross section at least 100 mm away from any cross section containing old borings, and on a diameter at 90^0 from the original borings. All borings on poles shall be carefully plugged with durable or creosoted plugs, as soon as the borings have been extracted.

NOTE
Acceptance of tested poles is done in two stages. The first stage consists of acceptance of poles suitable for treatment in accordance with 5. The second stage consists of assessing, in accordance with 9.3, whether the selected poles are subjected to satisfactory preservative treatment.

10 PRESSURE PERIOD

The creosote pressure shall be maintained long enough for the charge to comply with the requirements of 9 and for it to receive the minimum net retention specified in 8, or any higher value specified by the user. If the specified net retention is obtained and the sapwood penetrated as specified in 9.1 in less than one hour, pressure shall nevertheless be continued so as to complete the minimum period of one hour. If the required net retention has not been obtained after minimum pressure period of one hour, pressure shall be continued for a further periods of one hour each.

11 HANDLING TIMBER AFTER TREATMENT

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 accidentally 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 with hot creosote so as to minimize the danger of decay or of insect or borer attack. Holes bored in treated poles and not used shall not be left open but shall be poured full of hot creosote and plugged with tight-fitting durable or creosoted plugs.

APPENDIX A

HANDLING OF CREOSOTE

A.1 Safety

Creosote contains phenols which burn the skin and therefore the personnel handling the creosote in bulk, i.e. samplers and operatives, should wear gloves of PVC, or preferably polychloroprene, and a face shield. Both they and laboratory personnel should be made fully aware of the hazards and the appropriate first-aid treatment.

When creosote is used in enclosed spaces, adequate ventilation should be provided.

A.2 First-aid treatment

If a person is splashed with creosote, the following first aid treatment is recommended.

A.2.1 *Eyes*
Immediate treatment is vital. Thoroughly irrigate the eyes under a running cold water tap, or if it can be applied equally quickly, use copious quantities of buffered phosphate solution. A stock solution of the latter is prepared by dissolving 70 g of anhydrous potassium dihydrogen orthophosphate (KH_2PO_4) together with 180 g of disodium hydrogen orthoposphate dodecahydrate (Na_2 HPO_4 12 H_2 0) in 850 ml of water. One part of this solution is diluted with three parts of water and may then be kept for up to three months.
Skilled medical aid should be obtained as soon as possible.

A.2.2 *Skin*
Immediately wash the affected area with industrial methylated spirit or isopropanol (propan-2-ol) followed by a wash with soap and water.

SRI LANKA STANDARDS INSTITUTION

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