BANGLADESH RURAL ELECTRIFICATION BOARD

PBS INSTRUCTION 100-54/
BREB INSTRUCTION 500-25

STANDARD FOR INSPECTION, EVALUATION AND TREATMENT OF STANDING WOOD POLES

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SUBJECT: STANDARD FOR INSPECTION, EVALUATION AND TREATMENT OF STANDING WOOD POLES

1.0 SCOPE

This standard establishes the inspection, defect detection, evaluation and preservative treatment of standing wood poles used by different Palli Bidyut Samity (PBS) of Bangladesh Rural Electrification Board (BREB). The purpose of this standard is to assure Safety, Continuity, and Economy. Safety to the linemen working on the lines and to the general public. Continuity of electrical service by reducing outages caused by premature pole failures. Economy of operation by increasing the service life of the poles. These goals are attained by controlling the rate of failures due to wood decay and insects and thereby increase the service life of the standing poles.

2.0 GENERAL

2.1 This standard consists of specifications and conditions for the inspection and ground line preservative treatment of distribution wood poles on the Rural Electrification System of different Palli Bidyut Samity (PBS).

2.2 The Contractor will be made aware of any modifications or changes to these specifications to meet any special conditions.

2.3 Definitions: Terms used in this specification shall be defined as follows:

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2.3.1 Anchor: A rod with expanding head connected to pole by a guy wire, usually installed at a 45° angle from standing pole, used as pole support.

2.3.2 Back fill: The dirt which is replaced around the pole after excavation, inspection and treatment have been completed.

2.3.3 Bandage: A covering around the treated area to prevent the preservative from being absorbed by the soil.

2.3.4 Bore: To examine a pole by the use of a brace and bit to determine its internal condition.

2.3.5 Branding: Permanent marking on a treated wood product to identify the supplier and date of treatment; other information may be included in a brand when so specified.

2.3.6 Check: A lengthwise separation of the wood that usually extends across the rings of annual growth and commonly results from stresses set up in wood during seasoning.

2.3.7 The Pole Inspection Company: Pole Inspection Company, who will conduct inspection, evaluation and preservative treatment of standing wood poles.

2.3.8 Country Location: An area in which there are very few houses, and where there is little possibility of children or animals coming the contact with the treated poles.

2.3.9 Crew: One or more men who are working as a unit.

2.3.10 Cross Section: A cut or view of a pole that is made at right angles to the longitudinal axis of the pole.

2.3.11 Danger Poles: Any pole that is considered to need immediate attention by the utility.

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All danger poles are reported by phone to the utility and should be replaced within 48 hours. No lineman shall be allowed to climb or work on these poles unless they are properly braced and supported.

2.3.12 (a) Decay: Decomposition of wood substance by wood-destroying fungi. Two stages of decay are ordinarily recognized: The incipient and advanced stages. Syn: rot, dote, doze.

(b) **Decay, Advanced:** A stage of decay in which the wood has become definitely changed in appearance, character, composition, hardness, and specific gravity.

(c) **Decay, Incipient:** An early stage of decay in which the wood may show discoloration and/or early signs of fiber deterioration. Some of its properties may have deteriorated appreciably.

2.3.13 Decay Pocket: A decay pocket is any decay area, internal or exposed, which as a pocket-like form.

2.3.14 Distribution: Pole lines carrying equipment for service to individual electric customers, usually of lower voltage.

2.3.15 Ground line: The line around a pole to which the soil comes.

2.3.16 Ground line Area: That area from 12 inches or 30 cm above ground line to 24 inches or 60 cm below ground line.

2.3.17 G.L. Treat Tag: A metal tag, placed on a pole as high as possible above the treatment to indicate that the pole has been treated. The tag contains the date of treatment (year), the type or name of the preservative, the symbol or name of the company doing the treatment.

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2.3.18 Guy Stub: A shorter pole across road to take strain from pole with wires, a messenger connects from top of a guy stub to standing pole. A guy stub usually also has a down guy going from the point of attachment of the overhead guy to an anchor in the ground.

2.3.19 Guy Wire: A wire cable, attached either to a guy stub or to an anchor, used to support a pole.

2.3.20 Half Treat: When a pole is treated, but to less than the full required depth, it is known as a half treat.

2.3.21 "H" Frame: Two poles installed at right angles to the line, 12-16 feet (3.6-4.8 m) apart, with cross arms and braces designed to support transmission wires.

2.3.22 Heart Rot: The decay of the center of a pole.

2.3.23 Hook: The shell indicator, the instrument used to determine the amount of good wood remaining in the shell, is referred to as a hook or a shell thickness indicator.

2.3.24 Inspection: The checking of a pole for decay or defects by sounding, boring, visual observation and other inspection techniques.

2.3.25 Line: Any complete set of poles which provides a service between two points.

2.3.26 Load: The total number of wires, transformer's, etc. which are supported by a pole and configuration of the attachment on the pole i.e. whether a pole is an angle pole.

2.3.27 Partial Treat: A pole treated only part of the way around the circumference.

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2.3.28 Plug: A 3/8" inch or 0.95 cm treated dowel used to plug the hole after boring.

2.3.29 Pole Class: The class of the pole is determined by measuring the circumference of the pole at the top and at the ground line.

2.3.30 Pre-Inspection: The checking of a line prior to treatment to determine the number of poles to be treated, their condition, and the distance between them.

2.3.31 Procedure: The basic steps of inspection and treatment as set up in this spec. Procedure may not be changed without authorization by the supervisor and the customer's monitor.

2.3.32 Production: The number of poles inspected and treated per day.

2.3.33 Push Brace: A pole set at an angle to standing pole, where anchors or guy stub cannot be installed.

2.3.34 Quality Control: A continuing function of the wood preserver to assure that the timber product and its treatment are of high quality and meet the customer's specifications. A quality control man cooperates with, and assures that the final product is acceptable to the customer's inspector.

2.3.35 Reject: Any pole which is considered unfit for treatment due to decay, shell rot, top, etc. Rejected poles should be promptly replaced.

2.3.36 Reject Tag: A square tag placed at an angle on a pole at eye level, to indicate the pole

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has been rejected. Two square tags are placed on a danger pole. These poles should not be climbed unless proper precautions and safeguards are taken.

2.3.37 Rental or Attachment Rights: Where one company owns and maintains a pole and charges another company for rental or attachment rights.

2.3.38 Reported Pole: Poles, which the utility company desires additional information; they are listed on the work sheet but are not sounded, bored, or treated.

2.3.39 Residential Area: Any area in which there are houses, or where children or animals could come in contract with the treated poles.

2.3.40 Butt Rot: Sapwood or heartwood decay which is located below ground line.

2.3.41 Shakes: A separation along the grain, the greater part of which occurs between the rings of annual growth. Usually considered to have occurred in the standing tree or during felling.

2.3.42 Shell Rot: Sapwood decay of the above ground line portion of the pole. Shell rot may be present under a thin layer i.e., 1/2" of solid wood.

2.3.43 Sounding: The hammering of a pole with a sounding hammer in order to locate decay areas.

2.3.44 Sounding Marks: Marks produced by a sounding hammer during the sounding of a pole.

2.3.45 Spur Cut: Small cuts in a pole which are made by a lineman's gaffs. A spur cut that is larger or deeper than normal may be an indication that the shell of the pole is

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beginning to decay and this could create a climbing hazard to linemen.

2.3.46 Stub Pole: A 12-15 foot (3.6-4.5 m) section of a pole set and bolted to existing pole for reinforcement.

2.3.47 Survey: A visual inspection of the complete work assigned by a utility prior to the arrival of the crews.

2.3.48 Transmission: Pole lines designed to serve larger areas of population; with voltage usually higher than 13,000 volts.

2.3.49 Treat: A pole which has been treated, or is suitable for treating.

2.3.50 Treatment:

A. The preservative ground line treatment paste used for external application to the ground line area of a pole.

B. Hollow heart treatment for the internal flooding of cavities.

C. Fumigant treatment for internal treatment of poles from the inside outward. This treatment is applied where the wood still has structure. Where there is a cavity the hollow heart treatment is recommended.

2.3.51 Toll Lines: Pole lines for long distance telephone service.

2.3.52 Unit: Each individual pole is considered as a unit.

2.3.53 Utility: Electric, communication and railroad companies.

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2.3.54 Wood Preservative: The term preservative is intended to include such chemicals or combinations there of that will protect wood against deterioration from any one or combination of the following:- decay, insects, marine borers, fire, weathering, absorption of water, and chemical action.

2.4 Diagrammatical detail of common rots (decay), damages, checks, shakes, rate of pole failures, trees and poles, shall be as follows:-

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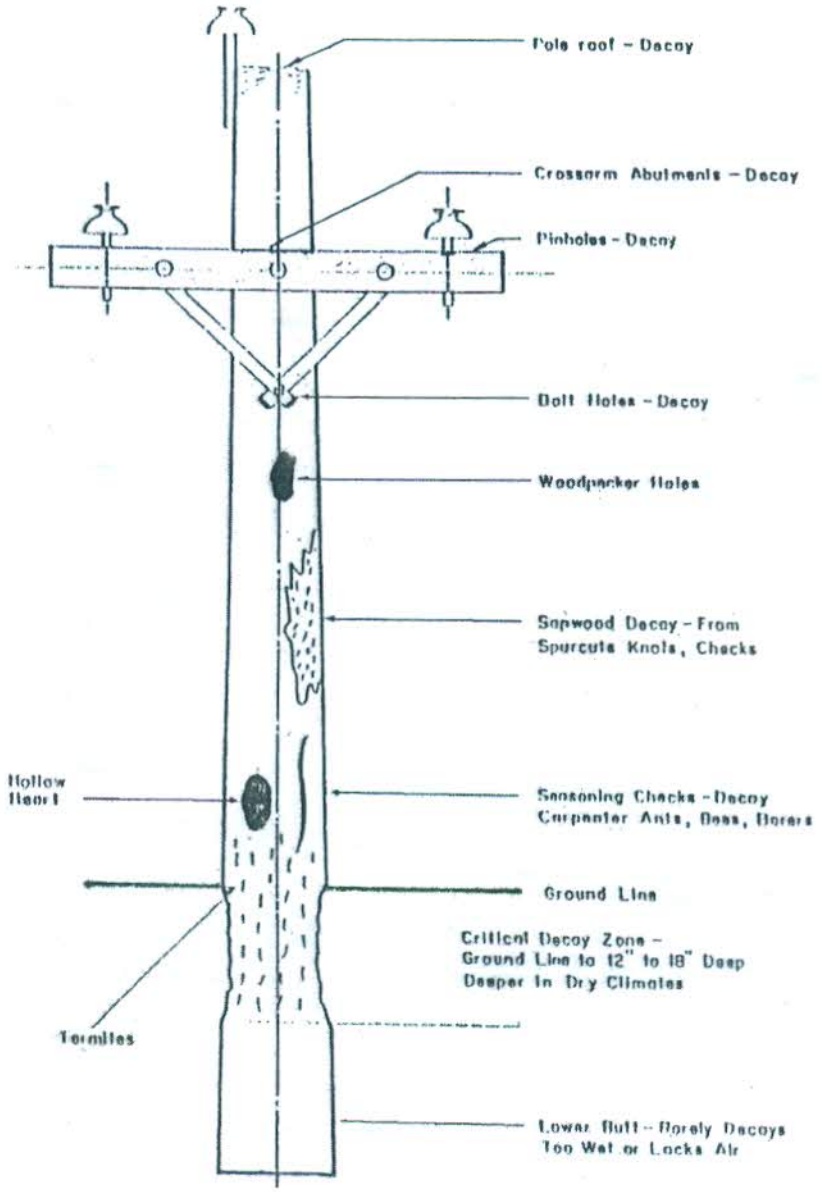
SECTION 2.4.1

COMMON POINTS FOR DECAY AND INSECT ATTACK



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2.4.2 Sapwood Rot (Shell Rot):

Sapwood rot or surface decay is decay occurring from the outer surface and progressing inward. Since the greatest proportion of the strength of a pole is in the outer fibers, this type of decay will seriously effect the strength of the pole as it progresses. Engineering studies have shown that 90% of the strength of a pole, in bending, is found in the outer shell equivalent to 22% of the diameter. In distribution sized poles, a shell thickness of about 2" thickness will provide the necessary strength. This figure can be given to inspector to facilitate their inspection in the field and save them calculations at each pole. If the shell thickness is less than 2" the pole should be rejected. Heart rot will reduce the strength of a pole for only a small percentage of the total strength in bending. When surface decay occurs in only the outer shell of the pole i.e., outer 1/2", it is called shell rot. This shell rot usually occurs above ground line and has an insignificant effect on the strength of a pole. (As per the drawing and discussion of pole loads on page 19). Where the shell rot is most hazardous is as a climbing hazard for lineman and the possibility of them "cutting" out as they climb the pole.

2.4.3 Outer Surface Decay Or Pocket Decay:

Poles with no treatment or poles which were butt dipped (with or without incising), may develop decay either on the outer surface, or decay pockets back of the treatment. A pole which has been incised and butt dipped in "Penta" will have a treatment approximately 1/2 inch in depth, or about one-half of the thickness of the sapwood. The

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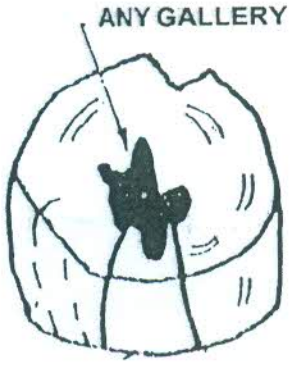
untreated sapwood behind the preservative is very susceptible to the fungi and decay may result.

When thin sapwood poles such as Douglas fir poles are used, decay may begin in the wood due to checking of the surface which will then expose untreated wood, either heartwood or sapwood, to decay fungi. This exposed wood is very susceptible to decay. When decay occurs in Douglas fir, in the initial stages, the wood will lose it's strength but the structure of the wood will appear to remain. Due to the thinness of the sapwood, the effectiveness of the remaining interior will be seriously reduced in strength.

2.4.4. Insect Damage:

Another cause of pole failure is due to insect damage. Insects such as carpenter ants and termites produce galleries throughout the pole. The insects not only weaken the pole by boring galleries but, also open the pole and provide an access to decay producing fungi. Special treatment is necessary in order to rid a pole of insects.



2.4.5 Bird Damage

In some areas, woodpeckers cause much damage to poles. This damage is usually confined to the upper portions of the pole. All woodpecker holes should be noted on the report forms.

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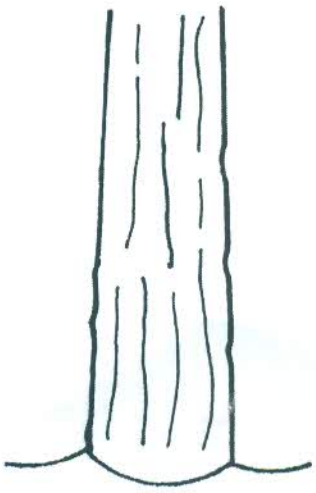
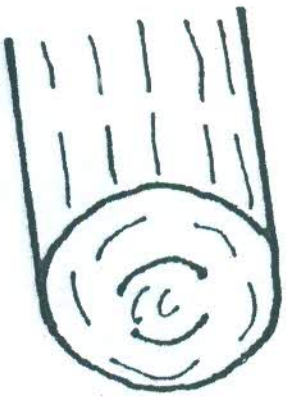
2.4.6 Checks:

Checks are longitudinal splits caused by the uneven shrinkage of the wood while the pole is seasoning, either before or after installation. This splitting is parallel to the grain and does not materially weaker the pole but, does provide an opening for the entry of decay producing fungi. When sounding with a hammer between two checks, a hollow sound is often observed. This is caused by the reverberations of the pole and does not indicate a decay pocket. Boring will reveal the true condition of the pole. A careful inspection should be given the bottom of a check since decay pockets often originate there.



2.4.7 Shakes:

Wind strain and careless falling of trees may cause opening to occur between the annular rings of a pole. Such openings are called shakes and are most easily seen in the butt of the pole. When a pole with such a condition is sounded, a hollow sound may be heard. Boring will reveal the correct internal condition of the pole. Since shakes are parallel to the grain and extend for some distance along the pole axis, they are often involved in the rapid spread of decay producing fungi.



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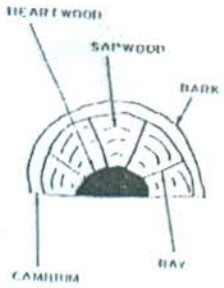
2.4.8 Heartwood Rot (Heartrot):

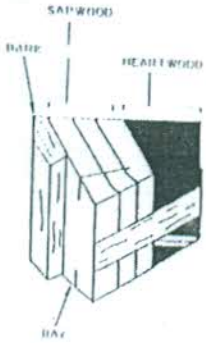
Heartwood rot, as the name implies, is the breakdown of the wood structure of the heartwood. The decay-causing organism gains access to the heartwood through checks, insects, borings, or by any other means whereby the heartwood is exposed. This type of decay reduces the cross section of a pole and is more dangerous since it generally cannot be seen. If a pole has heartrot, it will produce a hollow sound when struck with an hammer. In some cases the decay area is confined to a pocket located to one side of the pole. In the early stages, heartrot will cause the center of the pole to become punky, while in advanced cases, the whole center of the pole may be hollow.

2.4.9 Trees and Poles:



In order to better understand the problems and mechanics of the decay of wood poles, it is necessary to have some knowledge of the structure of tree trunks, from which poles are made. A cross section of any tree trunk will reveal several sections, each designed for a specific function, and each distinguishable by color, position, or texture.

The central core of the tree is known as the heartwood. It has no active life processes but, is the storage area for a number of different type of materials, such as dyes, resins, and tannins. The chief purpose of this section is support of the branches and foliage. In



a pole, the materials contained in the heartwood causes it to be more resistant to decay and to have a harder texture.

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The section which surrounds the heart wood is known as the sapwood, and with the heartwood comprises the "wood" of the trunk. It has no active life processes but, does function in the conduction of water. Unlike the heartwood, it has no accumulation of decay resisting materials, and hence, is more easily affected by decay when a tree is made into a pole.

The cambium, which is at the outer edge of the sapwood, is the area where life processes are still active. This section, only one cell thick, is responsible for any increase in size of the diameter of the tree. Around the above areas and visible from the outside of the tree is the bark. Its chief function is that of protection of the tree. Like the "wood" of the tree, it has no life processes. Inside this bark is the phloem or inner bark, which is involved with conduction of food materials. when a trunk is made into a pole, all the bark is removed.

Visible in the cross section of the tree, and extending from the center like spokes of a wheel, are rays. These structures function in the trans-location of materials between the center of the trunk and the outer regions.

2.4.10 What is Wood Decay:

1. Wood decay is caused by growth of microscopic plant life, known as fungi, in the wood tissue.
2. Fungi "seeds" (spores) are carried by the wind from fruiting bodies (conks and toadstools located on rotting stumps, logs etc.). When the spores fall on wood surfaces under favorable conditions they grow, producing microscopic tubular outgrowths which penetrate and destroy wood tissue, causing it to disintegrate.

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3. Favorable conditions for fungi growth include mild temperatures (65^0 Fahrenheit to 95^0 Fahrenheit), moist wood (over 20% moisture content), air, and wood substance for food.

4. Wood preservatives, in sufficient amount, arrest or kill the growth of fungi, and "poison" the wood, making it unfit for "fungi".

3.0 SPOT CHECKING

Spot checking is a means of sampling representative groups of poles on a system to determine the extent of pole decay and to establish the priority for a pole maintenance program. This should be done as an initial step in setting up a planned pole inspection and maintenance program. A general recommendation is to inspect a 1,000 pole sample made up of continuous pole line groupings of 50 or 100 poles in several areas of the system. The sample should be representative of the poles in place. For instance, all the poles on a line circuit or a map section should be inspected as unit and not just the poles of a certain age group. The inspection of the sample should be complete, consisting of hammer sounding, boring and excavation as described in section 4.0. Field data should be collected on the sample as to age, supplier, extent of decay, etc.

After the data has been collected, it should be analyzed to determine the areas with groups of poles having the most severe decay conditions and to establish priorities of a pole-by-pole inspection of the entire system. It may be desirable to take additional samples on other portions or areas of the system to determine if the severity of decay is significantly different to warrant the establishment of an accelerated pole inspection and maintenance program for that portion of the system. The results of the spot check will aid in scheduling a continuous pole inspection and maintenance program at a rate

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commensurate with the incidence of decay.

4.0 INSPECTION

4.1 Preparation

When work is to be done in close proximity to a home or on private property, the property owner should be notified as to what is being accomplished. All vegetation will be removed from around the pole to allow for proper excavation, inspection and treatment. Before any work is started, all reasonable precautions shall be taken to ensure that there will be no pole failures during the course of the work.

4.2 Above Ground Visual Inspection:

A visual inspection shall be made of all poles from the ground line to the top before any other inspection. Visual inspection shall include: type of wood, original treatment, age of pole, height, circumference, obvious splits, woodpecker damage, vehicle rub marks obvious defects such as shell rot, plant life growing on the pole, compression wood etc, and any other physical damage.

If visual appearance of pole indicates that the pole cannot reasonably endanger persons or those working on the pole, proceed with excavation. Defects observed sufficient to warrant rejection shall be reported and no further work undertaken.

4.3 Extended Visual Inspection: (Optional - When Requested by Division)

4.3.1 A visual inspection of the following items shall be performed by the Contractor, and a report submitted with the results.

A. Visible damage or rot on crossarms.
B. Broken or frayed down guys.

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C. Broken or disconnected ground wires (from the ground rod).

D. Abandoned anchors.

E. Broken glassware (including luminaries) or porcelain.

F. Damaged or missing cable guards (up to 8 feet (2.4 m)).

G. Any oil leaking equipment (Transformers).

H. Any obvious signs of burned or flashed areas.

I. Blown Lightning Arresters.

J. Remarks column for especial conditions.

4.3.2 An extended visual inspection shall be performed on all poles (owned by BREB/ PBS) in the area, including those not treated or inspected, such as concrete, steel, reported poles, etc.

4.4 Setting Depth Inspection:

Before excavation, setting depth of all poles shall be noted. Setting depth can be measured from the distance between ground line and original brand points of poles. In cases the setting depth may be more than the nominal depth due to post installation filling. In order to examine the conditions of original ground line of the pole the excavation depth may be extended more than the nominal depth (See 4.5). Nominal setting depth (ground line distance from butt) and brand point distance of different length of poles shall be as follows:-

Length of Pole (ft/m)	Setting Depth or Ground lin Distance From Butt (ft/m)	Brand point Distance Butt (ft/m)
25/7.6	5.0/1.5	10.0/3.1
30/9.1	5.5/1.7	10.0/3.1
35/10.7	6.0/1.8	10.0/3.1
40/12.2	6.0/1.8	10.0/3.1
45/13.7	6.5/2.0	10.0/3.1

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50/15.2	7.0/2.1	10.0/3.1
55/16.8	7.5/2.3	14.0/4.2
60/18.3	8.0/2.4	14.0/4.2
65/19.8	8.5/2.6	14.0/4.2
70/21.3	9.0/2.7	14.0/4.2
75/22.9	9.5/2.9	14.0/4.2
80/24.4	10.0/3.1	14.0/4.2

4.5 Excavation:

All poles passing the preliminary visual inspection shall be excavated. Poles rejected after visual inspection need not be excavated. Earth shall be removed from the entire circumference of the pole to a minimum depth of 18 inches (45.72 cm) below ground line. There shall be a 4 inch (10.16 cm) clearance from the pole surface at the bottom of the hole and 10 inches (25.4 cm) at the ground line and the side of the hole.

If there are riser shields, or a number of cables on a pole, it shall be excavated in a manner to permit inspection and treatment of the pole as much as possible while not damaging cables. The pole Inspection Company (P.I.C) shall be responsible for any damage done to cables during excavation.

In the case that it should not be possible to excavate at least 75 percent around the pole, the area excavated shall be externally treated and the pole shall also be treated with a Bangladesh Rural Electrification Board (BREB) approved fumigant (See 5.4).

Poles set in concrete are excluded for excavation, unless specifically requested by Rural Electrification Board. Poles in pavement will be inspected by sounding and boring and will be treated above the concrete with fumigant (See 5.4). The pole Inspection Company (PIC) will not inspect or perform any work on poles that are inaccessible due to natural causes (i.e, flooding, etc.) or other causes beyond the control of the company. These locations are

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to be recorded for future inspection follow-up.

4.6 Sounding:

Poles shall be sounded with a hammer from below ground line to as high as the Inspector can reach. Sounding shall be done on all four sides of the pole to locate any shell rot or internal pockets of decay. When a hollow spot is detected by sounding, this area shall be investigated by boring to determine it internal decay is present and it's extent.

4.7 Boring:

Inspector shall bore at least once at the ground line to check for interior decay. If rot or voids are detected, several borings shall be made per rot or void location, and a shell gauge indicator shall be used to determine the extent of all voids or rot.

Poles set in concrete or pavement shall be bored at the ground line down at a 45 degree angle into the pole and the boring sample checked for rot or voids. All holes shall be plugged with CCA treated dowels. The plugs should fit securely into the hole and be driven in with an hammer. The top of the plug should be flush with the surface of the pole.

4.8 Chipping:

All exterior decay must be removed from 18 inches (45.72 cm) below the ground line to as high as it might extend. No sound wood, however, shall be unnecessarily removed from the pole. When decay is removed from the pole, the edges shall be tapered to facilitate smooth wrapping of the bandage so that no pockets are left, under the bandage, which could trap water. Decayed wood shall not be removed from a reject pole to the point that a DANGER pole situation is created. All shavings and decayed pieces of wood shall be removed or collected from the hole and surrounding area and disposed of in accordance with proper

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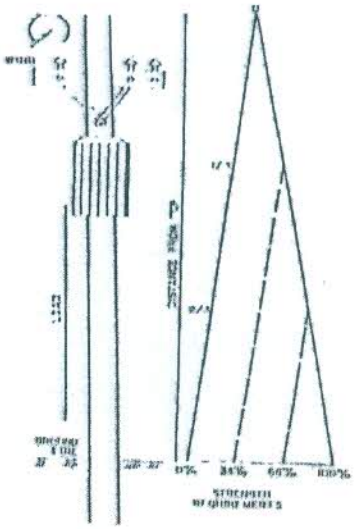
environmental practices (burial is the proper disposal method).

4.9 Evaluation:

After unsound wood has been removed, the pole must be evaluated. The reduction in circumference, as a result of decay, must be determined. This is done by determining the original circumference by measuring with a tape just above ground line. The reduced circumference must account for reductions from the four types of decay. The four types of decay are: (1) general external decay, (2) external pockets (exposed pockets), (3) internal pockets (enclosed pockets), and (4) hollow hearts.

General external decay is that decay which is found around the surface of the pole. Circumference reduction is determined by chipping away decayed wood and measuring the circumference at the smallest circumference in the ground line area.



To determine that reduction for an external pocket, first remove the decayed wood, measure the depth and width of the pocket, and refer to the pole circumference calculator (Osmose). For more than one external decay pocket, figure each pocket separately, and add, to get the total reduction (See TABLE-9).

An internal pocket is an off-center void. The pocket should be measured as described in Section 4.7 of this specification. After the dimensions of the pockets are determined, refer to the pole circumference Calculator to determine the total reduction (See TABLE-8).

The shell thickness of a pole with hollow heart shall be measured as described in Section-4.7. The pole circumference calculator will give the appropriate reduction for hollow

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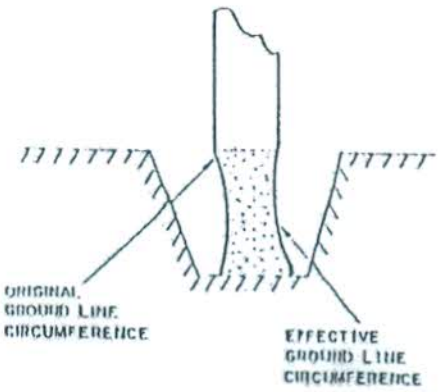
heart (See Table-10).

After all types of reduction are determined and added to find the total reduction in circumference, refer to the pole circumference calculator to determine if the pole has the required strength to remain in-service.



Pole loads, effective circumference, pole loading charts, wire equivalent index computation, minimum circumference calculation and tables, tables of enclosed, exposed and hollow hearts are given below:-

4.9.1 Pole Loads:

Forces which tend to bend and break a pole include the weight of the pole, the wires and other attachments, and the stresses produced by wind and storm. The strength needed by a pole to resist these loads and stresses, increases going from the top down to the bottom. As indicated by the sketch, maximum strength is needed at the ground line.

4.9.2 For example: a woodpecker hole near the top of the pole doesn't detract too much from the pole strength, but it may be critical if located in the lower half of the pole. The woodpecker hole should be investigated and judged on it's total effect on the pole and not simply on the size of the entrance hole. Woodpeckers can hollow out extensive cavities. These cavities will expose untreated or under treated heartwood or interior sapwood to the elements and to decay fungi. Bird dropping etc, from the nesting can accelerate internal decay.

More than 75% of pole decay occurs in the highly vulnerable ground line zone. Therefore,

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it is very important to evaluate the pole strength properly at the ground line.

4.9.3 Effective Circumference:

The strength of the pole relates largely to the amount of good wood in the ground line section. In effect, a measure of the circumference of the pole at the ground line, is a measure of its strength.

If there is any external decay this must be removed. If there is any decay pocket or hollow heart, its dimensions must be established by boring and probing with an inspection gauge, and, based on tables 1-10 of this spec. In marking the deductions to get the net effective circumference of a pole. It is necessary to remember that the decay which we see and remove is only part of the decay which is effecting the strength of the pole. In the apparently sound wood that remains on the pole there may be additional incipient decay which is hidden and insidious. This incipient decay reduces the strength of the wood and thus the strength of the pole.

4.9.4 Pole Loading Charts:

Pole loading is usually expressed in terms of "Wire Equivalents". Wire Equivalents are assigned in tables for the number and type of wires in the primary position, in the

secondary position, for service drops, telephone cables, transformers, etc. Pole loading charts give the Minimum Circumference permissible for a pole of a given height, species and length, and having a given number of wire equivalents. If the Minimum Circumference, developed from the chart, is smaller than the Effective Circumference then the pole is treated. If not, then the pole is rejected. Common sense must govern the actions of the pole Inspector.

Method For Determining Minimum Permissible Ground line Circumference of

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Distribution Pole (REA Bulletin 161-4, October 1974)

The procedure requires that the wire equivalents be equated to a wire equivalent index. This index is entered into the appropriate pole circumference calculation to determine the inches of ground line circumference required.

4.9.5 Wire Equivalent Index Computation

This table has been developed by REA, USA, to reference the number of equivalent wires to a single base computation using a 400-foot span as the standard.

To use this table, select the proper span length from the top line. Read down the appropriate column to the nearest equivalent wire figure which is shown. Read to the right-hand column to determine the proper wire equivalent index to be used in the "field Charts".

4.9.6 Pole Circumference Calculation:

When the proper wire equivalent index has been determined, refer to the field circumference charts.

1. Select the proper charts as to loading zone, i.e. **L** (light) or **M** (medium).
2. Select the proper chart as to species. The top line on each chart has the species names.
3. Select the proper line on the chart by inserting the previously determined wire equivalent index in the left hand column.
4. Read right until you come to the column market for the proper pole height.
5. The circumference can be read in this rectangle. If the rectangle is divided by a diagonal line, the upper left-hand portion is to be used if the pole is used in light loading area. If the pole is used in Medium Loading area, use the lower right-hand portion.

TABLE - 1

BANGLADESH RURAL ELECTRIFICATION BOARD				
PBS Instruction 100-54/ BREB Instruction 500-25: STANDARD FOR INSPECTION, EVALUATION AND TREATMENT OF STANDING WOOD POLES				
Date of Origin	Revised by	Approved by	Page No.	Revision No.
29/06/1991	BREB	BREB Board	Page **23** of **55**	2
Revision Date: 14/11/1996 & 19/02/2020				

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WIRE EQUIVALENT INDEX COMPUTATION

SPAN LENGTH (Feet)							
200	300	350	400	450	500	600	WIRE EQUIV. INDEX
Number of Equivalent Wires							
10	7	7	5	4	4	3	5
20	13	11	10	9	8	7	10
30	20	17	15	13	12	10	15
40	27	23	20	18	16	13	20
50	33	29	25	22	20	17	25
60	40	34	30	26	24	20	30
70	47	40	35	31	28	23	35
80	53	46	40	35	32	26	40

AS PER REA BULLETIN 161-4, 1974.

TABLE - 2
GRADE - C

L = LIGHT LOADM = MEDIUM LOAD

WIRE EQUIVALENT		CIVIT, FINISH PINE, SOUTHERN PINES & DOUGLAS FIR					
		25'	30'	35'	40'	45'	50'
5	L	16.5"	18"	19.5"	20.5"	22"	23"
	M	18.5"	20"	21"	22.5"	23.5"	24.5"

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10	L	20.5"	22"	23.5"	25"	26.5"	27.5"
	M	23.5"	25"	26.5"	28"	29"	30.5"
15	L	23.5"	25"	27.5"	28"	29.5"	31"
	M	26.5"	28.5"	30"	32"	33"	34.5"
20	L	25.5"	27.5"	29"	31"	32.5"	33.5"
	M	29"	31"	33"	35"	36.5"	38"
25	L	28"	29.5"	31.5"	33"	34.5"	36"
	M	31.5"	34"	36"	38"	39"	41"
30	L	30"	31.5"	33"	35"	36.5"	38"
	M	34.5"	36"	38"	40"	42"	44"
35	L	31"	33"	35"	37"	38.5"	40"
	M	35.5"	38"	40"	42.5"	44.5"	46"
40	L	33"	34.5"	36.5"	38"	40"	42.5"
	M	38"	39.5"	42"	44"	46"	49"

This ground line circumference table for Southern pine (SP) and Douglas fir (DF) have been taken from REA Bulletin 161-4, 1974. Civit (C) and Finish pine (PS) poles have been placed under this table because fiber stress value of these two species are almost same as SP and DF.

TABLE - 3

GRADE -C

L= Light load M= Medium load

WIRE EQUIVALENT		SUNDRI		
		25'	30'	35'
5	L	14.5"	16"	17"
	M	16.5"	18"	18.5"
10	L	18"	19.5"	20.5"

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	M	20.5"	22"	23.5"
15	L	20.5"	22"	24.5"
	M	23.5"	25"	26.5"
20	L	22.5"	24.5"	25.5"
	M	25.5"	27.5"	29"
25	L	25"	26"	28"
	M	28"	30"	32"
30	L	26.5"	28"	29"
	M	30"	31.5"	33"
35	L	37.5"	29"	31"
	M	31"	33"	35"
40	L	29"	30.5"	32"
	M	33"	34.5"	36"

This ground line circumference table for Sundri (S) have been developed from the formula A-B. Where, 'A' is the ground line circumference of Southern pine (SP) as per REA Bulletin 161-4,1974.

'B' is the percentage of difference between original ground line circumference of SP and S as per BREB publication 460-1988.

TABLE - 4

GRADE C

L= Light load M= Medium load

WIRE EQUIVALENT		GARGAN, APITONG & BAGTIKAN		
		25'	30'	35'
5	L	16"	17.5"	19"
	M	18"	19.5"	20.5"
10	L	20"	21.5"	22.5"
	M	22.5"	24"	25.5"

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15	L	22.5"	24"	26.5"
	M	25.5"	27.5"	29"
20	L	24.5"	26.5"	28"
	M	28"	30"	32"
25	L	27"	28.5"	30.5"
	M	30.5"	33"	34.5"
30	L	29"	30.5"	32"
	M	33.5"	34.5"	36.5"
35	L	30"	32"	33.5"
	M	34.5"	36.5"	38.5"
40	L	32"	33.5"	35.5"
	M	36.5"	38"	40.5"

This ground line circumference table for Garjan (G), Apitong (AP) and Bagtikan (BA) have been developed from the formula A-B.

Where `A' is the ground line circumference of Southern pine (SP) as per REA Bulletin 164-4, 1974.

`B' is the percentage of difference between original ground line circumference of SP and G, AP, BA as per BREB publication 460-1988.

TABLE - 5

GRADE - C
L= Light load M= Medium load

WIRE EQUIVALENT		TEAK & TALI		
		25'	30'	35'
5	L	15.5"	16.5"	18"
	M	17"	18.5"	19.5"
10	L	19"	20.5"	21.5"

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	M	21.5"	23"	24.5"
15	L	21.5"	23"	25.5"
	M	24.5"	26.5"	27.5"
20	L	23.5"	25.5"	26.5"
	M	26.5"	28.5"	30.5"
25	L	25.5"	27"	29"
	M	29"	31.5"	33"
30	L	27.5"	29"	30.5"
	M	31.5"	33"	35"
35	L	28.5"	30.5"	32"
	M	32.5"	35"	36.5"
40	L	30.5"	31.5"	33.5"
	M	35"	36.5"	38.5"

This ground line circumference table for Teak (T) and Tali (TL) have been developed from the formula A-B. Where "A" is the ground line circumference of Southern pine (SP) as per REA Bulletin 161-4, 1974.

`B' is the percentage of difference between original ground line circumference of SP and T/TL as per BREB publication 460-1988.

TABLE - 6

GRADE - C
L= Light load M= Medium load

WIRE EQUIVALENT		RED PINE (USA), RADIATA PINE (CHILE) SLASH PINE (AUSTRALIA) & AUSTRIAN PINE			
		25'	30'	35'	40'
5	L	17.5"	19.5"	21"	22"
	M	20"	21.5"	22.5"	24"
10	L	22"	23.5"	25"	26.5"

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	M	25"	26.5"	28.5"	30"
15	L	25"	26.5"	29.5"	30"
	M	28.5"	30.5"	32"	34"
20	L	27.5"	29.5"	31"	33"
	M	31"	33"	35.5"	37.5"
25	L	30"	31.5"	33.5"	35.5"
	M	33.5"	36.5"	38.5"	40.5"
30	L	32"	33.5"	33.5"	37.5"
	M	37"	38.5"	40.5"	42.5"
35	L	33"	35.5"	37.5"	39.5"
	M	38"	40.5"	42.5"	45.5"
40	L	35.5"	37"	39"	40.5"
	M	40.5"	42"	45"	47"

This ground line circumference table for Red pine (NP). Radiata pine (PR), Slash pine (PE) And Austrian pine (PS) have been developed from the formula A-B. Where, 'A' is the ground line circumference of Southern pine (SP) as per REA Bulletin 161-4, 1974. 'B' is the percentage of difference between original ground line circumference of SP and NP, PR, PE, PS, as per BREB publication 460-1988.

TABLE - 7
GRADE - C
L= Light load M= Medium load

WIRE EQUIVALENT		RED PINE (CANADA),PONDEROSA PINE,& RADIATA PINE (NEW ZEALAND)			
		25'	30'	35'	40'
5	L	18.5"	20"	21.5"	23"
	M	20.5"	22.5"	23.5"	25"
10	L	23"	24.5"	26"	28"
	M	24.5"	26"	27.5"	29"

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15	L	26"	28"	30.5"	31"
	M	29.5"	31.5"	33.5"	35.5"
20	L	28.5"	30.5"	32.5"	34.5"
	M	32.5"	34.5"	36.5"	39"
25	L	31"	32.5"	35"	36.5"
	M	35"	37.5"	40"	42"
30	L	33.5"	35"	36.5"	39"
	M	38.5"	40"	42"	44.5"
35	L	34.5"	36.5"	39"	41"
	M	39.5"	42"	44.5"	47"
40	L	36.5"	38.5"	40.5"	42"
	M	42"	44"	46.5"	49.5"

This ground line circumference table for Red pine (RP), ponderosa pine (WP) and Radiata pine (PR) have been developed form the formula A-B.

Where, 'A' is the ground line circumference of Southern pine (SP) as per REA Bulletin 161-4, 1974. 'B' is the percentage of difference between original ground line circumference of SP and RP, WP, PR as per BREB publication 460-1988.

Enclosed Pockets

Measurements of poles having enclosed pockets on one side, at or near the ground line, may be corrected by deducting the amounts given in the following table, in which depth refers to the maximum depth or radial dimension of the pocket. This table shows for example, that a pole having a 30-inch measured circumference, a minimum thickness of shell of two inches, and a pocket five inches deep is equivalent in strength to a solid pole having a circumference, of one inch less, or 29 inches.

TABLE - 8

BANGLADESH RURAL ELECTRIFICATION BOARD				
PBS Instruction 100-54/ BREB Instruction 500-25: STANDARD FOR INSPECTION, EVALUATION AND TREATMENT OF STANDING WOOD POLES				
Date of Origin	Revised by	Approved by	Page No.	Revision No.
29/06/1991	BREB	BREB Board	Page **30** of **55**	2
Revision Date: 14/11/1996 & 19/02/2020				

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POLES WITH ENCLOSED POCKETS

Measured Circumference of Sound Wood (in Inches)	Thickness of Shell on Thin Side (in Inches)	Maximum Depth of Pocket in		
		3.0	4.0	5.0
22-30	1.0	2	2	3
22-30	2.0	-	1	1
22-30	3.0	-	-	-
31-38	1.0	2	3	3
31-38	2.0	1	1	2
31-38	3.0	1	1	1
39-50	1.0	2	3	4
39-50	2.0	1	2	2
39-50	3.0	1	1	1

Measurements of poles having exposed pockets of varying shapes and dimensions, at or near the ground line, may be corrected by deducting the amounts given in the following table, in which width refers, in general, to the horizontal width at the outside of the pole, and depth is the average distance obtained by measuring at right angles from a straight-edge (such as the prod carried by the inspector for other purposes) placed across the pocket. This table shows, for example, that a pole having a measured circumference of 30 inches and an exposed pocket 4 inches wide and 3 inches deep will be equivalent in strength to a solid pole having a circumference of 5 inches less than 30, or 25 inches.

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TABLE - 9

POLES WITH EXPOSED POCKETS

Deductions to be made from measured circumference in inches to obtain circumferences of equivalent solid poles.

Depth of Pocket (inch)	Width of Pocket In inches							
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.0	1	1	2	2	3	3	4	5
2.0	1	2	3	4	5	6	7	8
3.0	1	2	4	5	6	8	9	11
4.0	2	3	4	5	7	9	10	13
5.0	2	3	4	6	7	9	11	-

*** NOTE** 1) To convert figures in inches to centimeter multiply inches by 2.54.

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TABLE – 10 (POLES WITH HOLLOW HEARTS)

Deductions to be made from measured circumferences in inches to obtain circumference of equivalent solid poles.

Measured Circumference of Sound Wood of Hollow Pole in inches	Minimum Thickness of Shell in inches						
	2.0	2.5	3.0	3.5	4.0	4.5	5.0
20	1	–	–	–	–	–	–
21	1	–	–	–	–	–	–
22	1	1	–	–	–	–	–
23	1	1	–	–	–	–	–
24	1	1	–	–	–	–	–
25	1	1	–	–	–	–	–
26	1	1	–	–	–	–	–
27	1	1	1	–	–	–	–
28	1	1	1	–	–	–	–
29	1	1	1	–	–	–	–
30	2	1	1	1	–	–	–
31	2	1	1	1	–	–	–
32	2	1	1	1	–	–	–
33	2	1	1	1	–	–	–
34	2	1	1	1	1	–	–
35	3	2	1	1	1	–	–
36	3	2	1	1	1	–	–
37	3	2	1	1	1	–	–
38	3	2	1	1	1	1	–
39	3	2	1	1	1	1	–
40	4	2	2	1	1	1	–
41	4	3	2	1	1	1	–
42	4	3	2	1	1	1	1
43	4	3	2	1	1	1	1
44	5	3	2	1	1	1	1
45	5	3	2	2	1	1	1
46	5	4	2	2	1	1	1
47	6	4	3	2	1	1	1
48	6	4	3	2	1	1	1
49	6	4	3	2	1	1	1
50	6	4	3	2	2	1	1
51	7	5	3	2	2	1	1
52	7	5	4	2	2	1	1
53	7	5	4	3	2	1	1
54	8	5	4	3	2	1	1
55	8	5	4	3	2	2	1
56	8	6	4	3	2	2	1
57	9	6	5	3	2	2	1
58	9	6	5	3	2	2	1
59	9	7	5	4	3	2	1
60	10	7	5	4	3	2	1

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*Poles with hollow heart which have a minimum shell thickness of less than two inches should be condemned.

***NOTE:** 1) To convert figures in inches to centimeter multiply inches by 2.54.

5.0 TREATMENT AND PRESERVATIONS

5.1 All preservative chemicals used in conjunction with external treatment, internal treatment and fumigant treatment described herein must be approved and registered for the end uses described. All containers which have been used for preservatives must be returned to the BREB Store house, or other designated area for proper disposal.

5.2 External Treatment

All poles excavated and not previously rejected shall be covered from 18 inches (45.72 cm) below the ground line to 3 inches (7.62 cm) above the ground line by a BREB approved preservative. This preservative shall be applied in a coating approximately 1/8 inches (3 cm) in thickness. This preservative is to be covered by BREB approved moisture barrier wrap which is a dark colored heavy kraft paper which is polyethylene coated to retain the preservative. Such wrap shall extend 1 inch (2.54 cm) above the treated area and wrap around the pole with a minimum of 4 inches (10.16 cm) overlap which is stapled to the pole. The wrap must fit smoothly to the pole so that there will not be pockets between the wrap and the wood which would allow water to accumulate. Both preservative and warp shall be applied in accordance with the BREB and the Manufacturer's recommendations.

The external preservative will consists of:

Name of Active Ingredients		**Content(%)**
Sodium Fluoride	:	43.7
Creosote	:	40.0
Dinitrophenol	:	2.0
Potassium Dichromate	:	3.1
Inert Ingredients	:	11.2
Total	**:**	**100**

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Or BREB approved equal.

Where obstructions occurs such as fences, curbs, walls, cable risers, interfering ground rods, etc, the preservative shall be applied in excess amount near the obstruction and the moisture barrier wrapped as close to the obstruction as possible.

5.3 Internal Treatment

Poles found to have specific voids or internal decay pockets are to be internally treated. This should involve a sufficient number of 3/8 inch (0.95 cm) diameter bored holes and the preservative should be applied under a pressure of at least 50 pounds per square inch 3.5 kg/cm²). One gallon minimum per cubic foot (133 litre/m^3) of wood treated will be applied or to refusal. Holes should be plugged with CCA treated dowels.

This liquid internal treating solution will consist of:

Name of Active Ingredients		**Content (%)**
Sodium Fluoride	:	4.72
Sodium Dichromate	:	2.08
Sodium Arsenate	:	2.08
Aldrin	:	0.51
Inert Ingredients	:	90.61
Total	**:**	**100**

Or BREB approved equal.

When using this product, care should be taken to avoid contacting anyone or contaminating the surroundings. All proper safety gear should be used to protect oneself from the preservative. This product is not to be used on poles in standing water.

5.4 Fumigant Treatment

All poles that cannot be properly excavated around 75 percent of the circumference for causes

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beyond the Contractor's control, such as concrete, pavement, tree roots, cables, etc, shall be bored above ground and treated with a fumigant.

The fumigant treatment will consist of:

Name of Active Ingredients		Content(%)
Sodium Methyl Dithiocarbamate	:	32.7
Inert Ingredients	:	67.3
Total	**:**	**100**

Or BREB approved equal.

Using the pole's circumference at ground line, the Contractor shall determine from the following chart the amount of internal treatment solution (fumigant) to be used on the wood pole and the number of holes to be drilled in the pole in order to apply the solution.

Poles Circumference	Pints of Fumigant	Number of Holes
20 - 45inches (50 - 114 Cm)	1	4
Over 45 inches(Over 114 Cm)	2	6

The drilled holes shall be 3/4 inch (1.90 cm) in diameter slanting and approximately 15 inch (38 cm) deep. Holes shall be located starting at ground line 120 degree apart at one foot (30.5 cm) intervals.

Starting at the ground line away from seasoning checks, the Contractor shall drill a hole directly towards the center of the pole at a steep downward angle (about 50 degree to 60 degree). The remaining holes shall be drilled roughly equally spaced around the pole, 120 degree apart, in a spiral pattern up the pole with a vertical distance of about 12 inches (30.5 cm) between holes. Holes shall be kept away from seasoning checks.

If a treating hole intersects a seasoning check much of the fumigant will be lost. Therefore, the Contractor shall plug that hole and drill another. If more than two treating holes intersect an internal void or rot pocket, the Contractor shall redrill the holes further up the pole into relatively solid wood where the fumigant will gradually volatilize and more through the wood.

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Where rot pockets are present the Contractor shall dig down and drill holes below in sound wood as well as above and pour in fumigant. It is imperative that the fumigant be placed in sound wood above and below any internal decay pockets.

The Contractor shall fill all treatment holes with treated plugs. These plugs shall be tight fitting and shall be driven to within 1/2 inch (1.27 cm) of the pole, but shall not be driven flush with the pole.

5.5 Indegeneous Low Cost Preservation Process

Wood Testing and Research Laboratories under Timber Product Special Department of BREB has developed a low-cost process for preservation of timber products. The process is described below and shall be applied as and when necessary.

5.5.1 Preparation of Preservation Ingredient (HBC-Heavy Aerosol Boron)

Preservation Ingredient	Proportion of Ingredient in Percentage by Weight	Ingredient Proportion by Weight (Example)
Heavy Creosote	41.30%	475 gm.
Boric Powder	41.30%	475 gm.
Sodium Dichromate	4.35%	50 gm.
Grease (inert)	13.05%	150 gm.
Total :	100.00%	1,150 gm.

5.5.2 Preservation Preparation : Heavy Creosote Solution to be weighed and poured into a large plastic bucket or tin/plastic drum. Now 4.35% fine grained (if grains are coarse, it is to be crushed to get fine grains) sodium dichromate or sodium bi-cromate (9.5 times in weight of the creosote solution) to be poured in creosote solution and stir thoroughly

with a wooden/bamboo/metal bar. Fine grained boric powder of equal weight of creosote solution shall now to be mixed with the prepared solution by stirring thoroughly.

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Solution so prepared to be stored for a night. 13.05% of grease (3.17 times less in weight than the creosote solution) to be added next day and stirred thoroughly to prepare a pest. to consolidate the solution in pest form, quantity of grease may be increased or decreased. Thus prepared is the preservation for wooden poles.

5.5.3 Approximate Cost of Ingredient and Probable Place Where They May be Found.

Sl. No.	Ingredients	Approximate Cost	Probable Place of Availability
1.	Heavy Creosote (Commercial Grade)	Tk. 30.00 / Kg	Nazrul and Brothers Ltd. 6/A, Mohiuddin Lane Imamganj, Dhaka or Ship Brand Bitumen Manufacturer Tejgaon, Dhaka or Bitumen Manufacturer Chittagong
2.	Fine grained Boric Powder (Commercial Grade)	Tk. 80.00 / Kg	Chemical products Distributor/Retailer shops at Mitford Hospital Road, Dhaka or any other chemical product merchant in the country
3.	Fine grain Dodium Dichromate	Tk. 100.00 Kg	Chemical products Distributor/Retailer shops at Mitford Hospital Road, Dhaka or any other chemical product merchant in the country
4.	Grease (Commercial Grade)	Tk. 100.00 Kg	Any Hardware store

5.5.4 Cost of Preservation for each Pole: 1,150 gm of preservative can cover an area of 0.624 sq meter (6.718 sft) if applied at the ground line of a pole with a thickness of application of 3 mm. On this basis cost of preservative to apply on the ground line of a pole is about

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5.5.5 Result of application of the preservative: Preservative prepared according to the process described in para **5.5.2**, when applied 3 mm thick on green (wet) and dry but unpreserved or CCA preserved sundari log on the surface and sawed end, boric acid penetrated sap wood within seven days of application, and the entire log (heart and sap wood) within 15 days of application. In similar way boric acid has penetrated douglas far, teak, chamla and civit log within 15 days of application. The preserved wood has become resistant to fungus, weevil, termite and other insects. No infection by fungus was observed on treated sundari log kept in wet place like bathroom for 15 days. When treated poles came in contact with water, boric acid is washed away slowly and progressively, but once penetrated deep inside the wood it takes long time to get dissolved. In western countries boric rod (made of boric acid) is inserted into log by drilling holes in the wood. Boric acid has excellent property of spreading in the wood.

5.5.6 Preservative Application Procedure: Preservatives are to be applied in 3 mm thickness on green or dry treated or untreated wood and for the first 15 days to be kept covered by a polyethylene sheet so that the preservatives are not washed away before it penetrates the wood. After 15 days of application dried up preservative may be collected from log surface and mixed with new paste for reuse.

5.5.7 Location on the log and time for application of preservative:

1. At the top of old used pole
2. On the damaged portion of the pole
3. On the wood pecker hold
4. Sawed end of recently cut pole or anchor log
5. Cracked part of pole stored more than one year in the store house

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6. Before placing of pole on the ground - from 7.5 cm (3") above ground line to 45 cm (18") below ground line covering a net length of 52.50 cm of the pole
7. Inside the newly drilled hole
8. 7.5 cm (3") above ground line and 45 cm (18") below ground line covering a length of 52.50 cm of pole already installed on the ground

Time of application: Normally in dry season. Never to be applied in the monsoon, in the rainy days and when water is logged around pole. To be applied first around the ground line of Bangladeshi poles already installed. Application to be started first on the oldest poles and to proceed progressively towards newer poles.

5.5.8 Application procedure on the Ground line of the pole:

Earth around pole to be dug approximately 50 cm (20") deep and care to be taken so that pole is not damaged during the digging. At the ground line hole will be 25 cm (10") from edge of the pole all around and at the bottom 10 cm (4"). After digging the poles will be evaluated in accordance with PBS instruction 500-25 and PBS instruction 100-54. Poles suitable for retaining in the line, will be cleaned with brush and mud removed and presence of slightly rotted wood, will be shaved by a sharp knife . 3 mm thick layer of preservative pest will be applied by brush from 7.5 cm (3") above the ground line of the pole and up to 45 cm (18") below the ground line of the pole. Now preserved area of the pole to be covered by polythene sheet in such a way so that length of the polythene sheets extended beyond preserved area by 25 mm (1") on both ends and wrapped 100 mm (4") portion of the sheet around the pole overlaps by at least 100 mm (4").

Polythene sheet to be placed with the pole in such a way so that there remains no gap between the sheet and the pole. Polythene sheet to be fixed with the pole either by staple or by rope. Hole dug previously around the pole to be filled by garbage free soil. Filled

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soil shall be compacted and be placed at least upto 7.5 cm (3") above ground line of pole around pole surface and sloped with the ground, so that after rain soil settles along the ground line level and water does not accumulate around pole ground line. Care should be taken so that polythene sheet in no way is displaced from the pole during earth filling. Ground line treated pole shall be marked at eye sight level on the road side front

of the pole by red ink. Making shall be GLT-95 for example, where GLT would mean "Ground line treated and 95 would mean year of treatment. From this marking, it will be possible to identify the ground line treated pole and year of treatment for further treatment say after 5 years.

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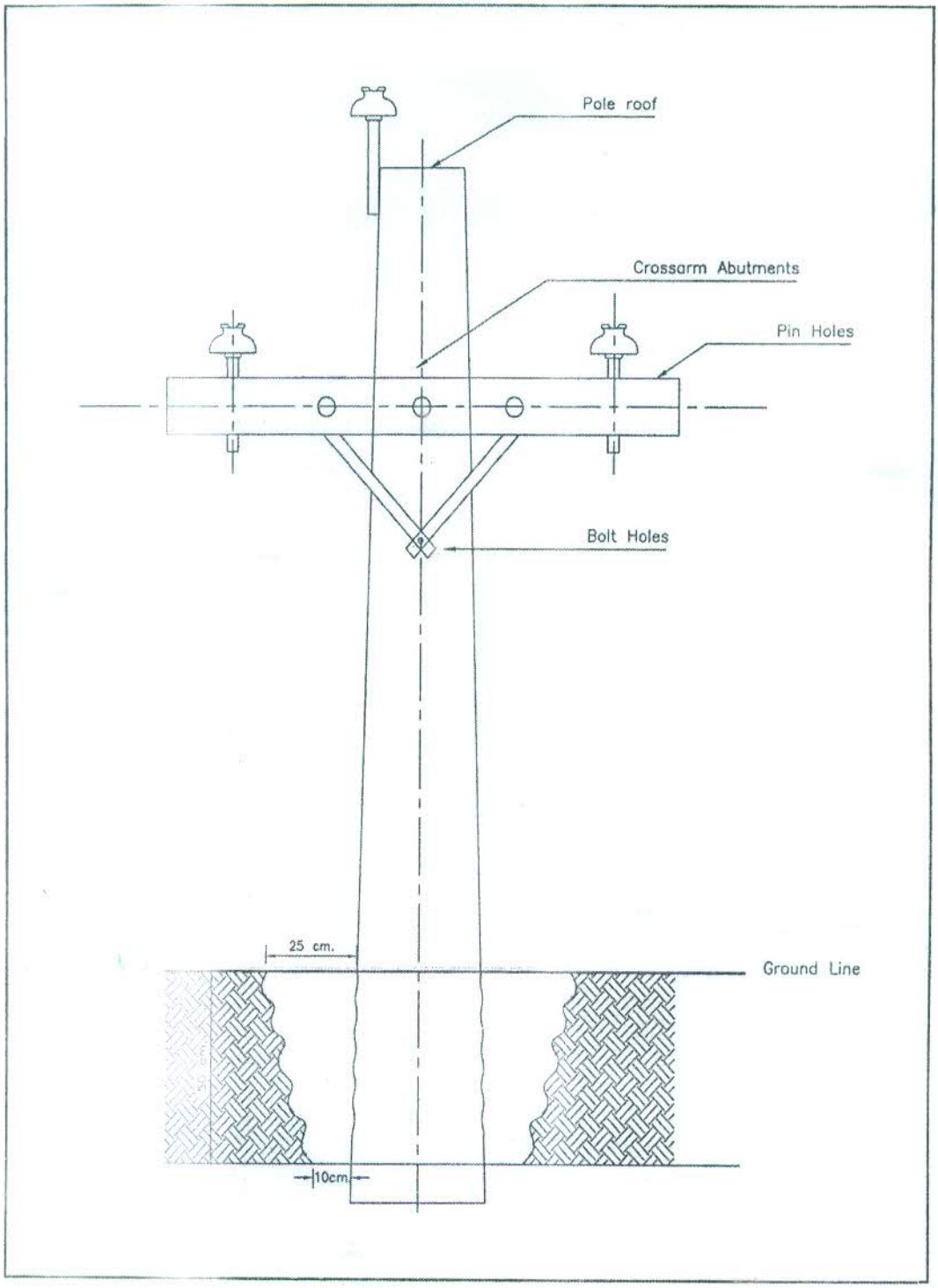

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PBS Instruction 100-54/ BREB Instruction 500-25: STANDARD FOR INSPECTION, EVALUATION AND TREATMENT OF STANDING WOOD POLES				
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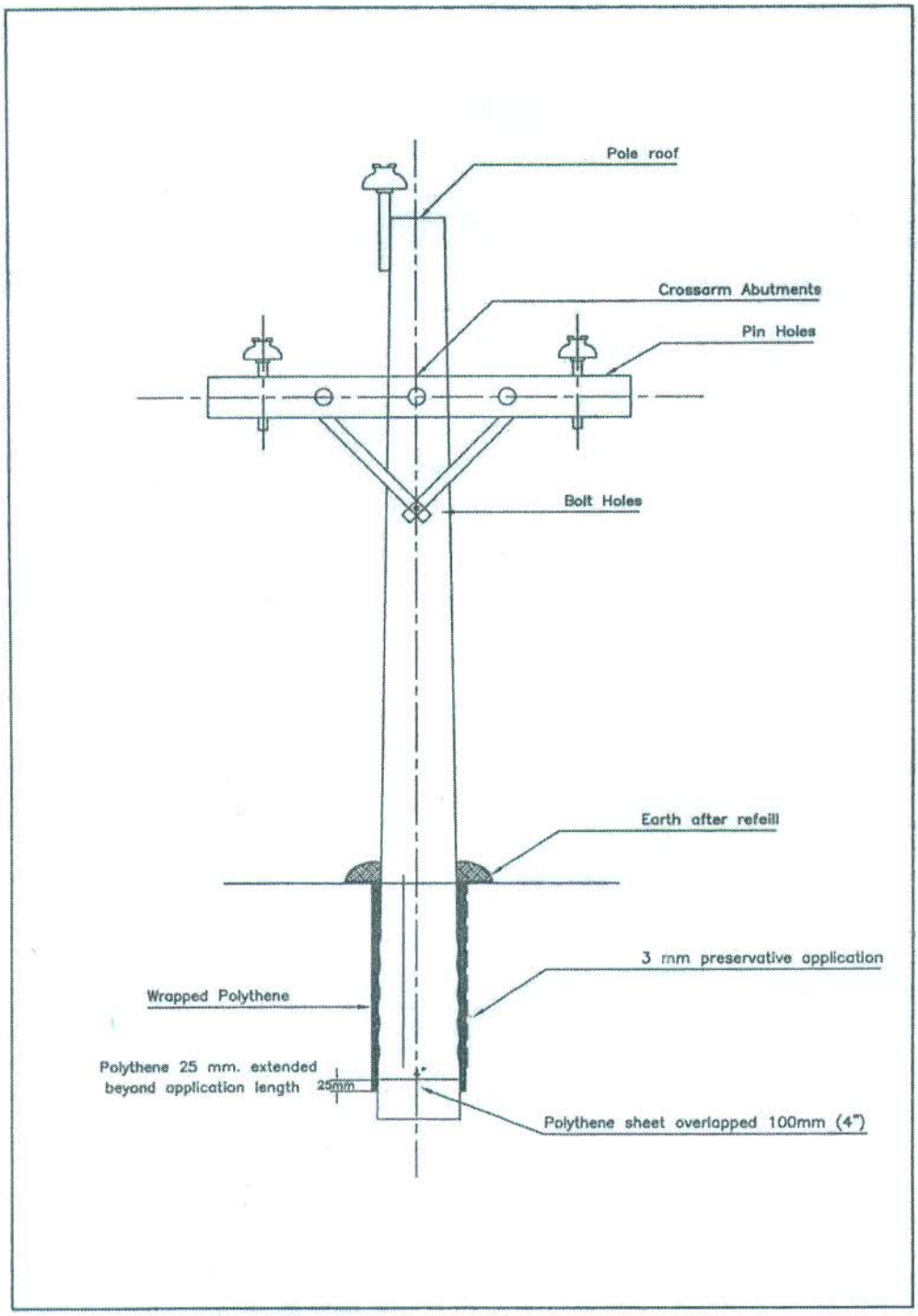

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5.5.9 **Precaution:** Creosote and Sodium di-cromate shall not be touched and handled by hand and care shall be taken so that it does not come in contact with human body, eyes and face. It should be kept beyond reach of children. Prepared preservatives out of these ingredient shall also be handled carefully in a similar way and kept stored under lock and key. The preservative shall not be thrown in pond, canal, river and can not be littered on roads or any other places. It is prohibited to apply the preservative during rain or in water.

6.0 REJECT CLASSIFICATION

6.1 Danger Reject - (Re-enforceable or Non-Re-enforceable):

This is any pole that is hollow and the thickness of the sound wood at the thinnest section of shell is less than one inch (2.54 cm). It possesses a hazard to workers and the public. Subject to local requirements, the Inspector shall call in with locations daily. The Inspector shall then determine whether the pole is re-enforceable and tag accordingly. A BREB representative shall decide whether the pole will be replaced immediately or reinforced by Contractor's crew.

6.2 Normal Reject - Non-Re-enforceable

This includes all poles which do not meet the criteria in Section

6.3 These poles will be changed out by BREB/PBS.

6.4 Re-enforceable Reject:

After initial inspection has revealed that the pole is below required strength, the following shall be performed:

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6.4.1 Sound the pole thoroughly above ground line again. Concentrate at the zone 15 inches (38 cm) to 4-1/2 feet (1.37 m) above ground line.

6.4.2 Drill at 4-1/2 feet (1.37 m) above ground line both with and against the line of lead. If the average shell thickness is 4 inches (10.16 cm) or more, the pole can be reinforced. Go to step **6.4.3**. If the average shell is less than 4 inches (10.16 cm), the poles should be checked at 5-1/2 feet (1.67 m) for 4 inches (10.16 cm) of shell or not reinforced.

6.4.3 Drill sufficient holes at 15 inches (38 cm) above ground line to determine shell thickness. If shell thickness at 15 inches (38 cm) is less than 2 inches (5 cm) go to step **6.4.4.** If the shell is 2 inches (5 cm) or greater, reinforce the pole with a banding system.

6.4.4 Poles with less than 2 inches (5 cm) of shell at 15 inches (38 cm) can be reinforced if there is 2 inches (5 cm) of shell at 26 inches (66 cm) and the criteria in step 6.3.2 are met. When the shell requirements are raised from 15 inches (38 cm) to 26 inches (66 cm) above ground line, a truss with an additional one foot (30.50 cm) of length must be used.

7.0 BACK FILLING

7.1 Filling

After treatment, the excavation will be refilled and tamped to a point 3 inches (7.62 cm) above the ground line to allow for settlement. Care should be taken so that the rocks and stones will not tear or puncture the protective wrapping. In pastures or other areas where it is obvious that livestock may come in contact with treated poles, an extra reinforced wrap will be stapled around the top of the moisture barrier, extending upwards high enough to prevent any human or animal contact.

7.2 Cleanup:

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No debris, loose dirt etc. is to be left in the pole area. Private property turf, bushes, etc, are to be replaced with care. If at any time there are conflicts with a customer as to the cleanup procedure, a REB/PBS representative is to be contracted immediately. If any preservative is spilled on the ground it is to be cleaned up immediately.

8.0 POLE BRANDING, MARKING AND MAPS

8.1 Original Brands/Marks on Pole:

It is mandatory to brand (either burn branding or metal/plastic tagging, plastic tags used only by the manufacturer from Finland) each pole originally at specific height (Section 4.4) with code letters to designate the manufacturer (in first row), the treatment plant location, month and year of treatment (in the second row), the species (kind) of wood, preservative and retention of preservative (in the third row), and the pole class and length (height) (in the last or fourth row). These brands may vary according to the manufacturer and users requirements. A typical branding and most code letters for wood species, plant location, preservative, retention and designation of the manufacturer are shown below:

Brands Used On Forest Products

Typical Brand and Key

BFIDC (Manufacturer's Brand) Bangladesh Forest Industries Development Corporation

K-8-80 (Plant Designation, Month and Year of Treatment) - Khulna, August, 1980.

S SK XH (Species of Timber, Preservative & Retention) Sundari, CCA-C, Extra heavy Retention.

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6-30' (Class and Length of Pole) - class 6, and 30' long Pole.

Species Code	Plant Code	Preservative Code
S = Sundury	K = Khulna	P = Pentachlorophenol
T = Teak	C = Chattogram	SK = CCA Type-C
TL = Tali	KP = Kaptai	SB = ACA
C = Civit	FL Florida	
G = Garjan	VA = Valdosta	
SP = Southern Pine	GA = Georgia or D = Delson	XH = Extra Heavy
PS = Finish Swedish & Australian Pine		Extra Heavy = 1.25

Species Code	Manufacturer's Brand
WP = Ponderosa Pine	BFIDC = Bangladesh Forest Industries Development Corporation
RP = Red Pine (Canada)	Koppers = Koppers Co. USA
NP = Red Pine, USA	LA = Langdale Co. USA
DF = Douglas Fir	FTP = Finnish Treated Pole
PR = Radiata Pine (Chile & New Zealand	(Finntrepo), Finland
AF = Afina (Ghana)	AG&P = Atlantic Gulf 7 Pacific, Philipines
AP = Apitong	SWP = Shouthern Wood Piedmont, USA
PE = Slash Pine (Australia)	CCA = Canadian Creosoting Company (DOMTAR Co. Canada)
	A = Atlantic Wood Industries, USA
	E = Escambia Treating Co. USA

8.2 Secondary Marking of Standing Poles

All poles will be marked with the appropriate tag which determines what was done to the pole.

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All reject and re-enforceable poles will be indicated on the map.

8.3 Maps: The BREB/PBS shall provide maps to the Contractor.

9.0 POLE REPORTS AND WORK SUMMARIES

9.1 Report Records

The following information shall be recorded on a form by the Contractor (Pole Treating Company):

A. Poles inspected by, street address, pole number, or other means.

B. Pole brand data (estimated if not legible) with Treatment plant location.

C. Pole height and class.

D. Species of wood.

E. Original treatment (preservative, penetration and retention).

F. Condition of pole above ground line and ground line.

G. Pole setting depth.

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9.2 Work Summary

Upon completion of the project by division, the Contractor will provide the BREB/PBS with a summary that will include the following:

A. Poles excavated and treated.

B. Poles excavated and rejected.

C. Total poles excavated.

D. Poles sounded and bored - accepted.

E. Poles sounded and bored - rejected.

F. Total poles sounded and bored.

G. Poles fumigated.

*H. Danger rejects.

I. Poles internally treated.

J. Re-enforceable poles - treated.

K. Total poles inspected and accepted.

L. Total poles inspected and rejected.

***NOTE:** These poles should be highlighted in **red ink** on the report.

10.0 QUALIFICATIONS AND QUALITY CONTROL

10.1 Specification and Inspection Qualifications

Treatment and inspection work shall be done or supervised by a foreman with a minimum of thirty (30) days training from BREB and shall be certified by BREB as being qualified for this work.

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The Contractor shall furnish all supervision, labor, tools, equipment, and materials necessary to inspect and treat all poles as per this specification.

The BREB/PBS will furnish the Contractor with maps and assistance, if necessary, in locating specific lines which are subject for inspection and treatment.

The BREB/PBS will provide storage space for equipment and materials. BREB will provide theoretical and practical training locally to the foreman and supervisors. Cost of such training will be to the account of the trainee.

10.2 Supervisory Qualifications

Supervision of foremen, for pole inspection and treatment, shall be performed by the Contractor using supervisors with at least ninety (90) days experience in the art of wood preservations, quality control & pole inspection. A supervisor shall be certified by BREB as being qualified for this work.

10.3 Crew Set-Up

There is no set manner in which a crew must be organized. Each job will have peculiarities which will require either few or many men. The foreman should organize his men in their jobs to the best advantage. Below is a sample of supervisor, foreman and crew organization which is minimum.

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REB Wood Products Representative -- Monitoring

Company Manager/Director

Pole Treating Company's Supervisor: :Supervision and Quality Control :

One Set	: Foreman --- Inspection, Treating and Back filling.
	: Crewman (2) --- Digging.
	: Crewman (1) --- Treating and Back filling. (This man is usually a foreman trainee, or the second in command).

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10.4 Quality Controls

The Inspector's work will be periodically checked by BREB, Wood Products representative and the Contractor's supervisor. The re-inspection shall consist of re-excavating, removing wrapping, and treating. The pole will be completely re-inspected and treated and a quality control sheet made out. If serious errors are discovered, all poles back to the last quality control shall be re-inspected and retreated at no cost to BREB/PBS.

11.0 QUALITY, SAFETY AND FIRST AID

11.1 Quality of Work

The pole treating business is a highly competitive type of technical work and always requires the best of workmanship. The future customers depend on the quality or work done in the field. The work by the foreman and his crew, the procedure he follows and the completed job demonstrates to the utility inspector and the general public a well organized and trained crew.

The depth of the excavation, detailed examination and evaluation of the pole, sufficient amount of preservative chemicals, neat application of the bandage and proper amount of back fill are few of the many points which will result in a good job.

It is imperative that the foreman will follow the procedure outlined in this specification.

11.2 Safety and First AID

Safety is everyone's business, but it is especially the responsibility of the foreman. Whether he is working alone, or with a group of men he should be aware of the safety of himself and his men.

The pole treating business does not have as many hazards as does the lineman work or

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line clearance business, but it is not without dangers. Shocks, broken bones, burns, or pulled muscles are only a few of the things which can happen to the pole treater, to say nothing of the accidents caused by automobiles.

The foreman should develop a careful safety conscious crew. If all the jobs are done in a correct manner, they will be done safely. The less accidents there are on the job the better will be the moral of the crew.

If accidents do occur the foreman should know the basic steps of first AID. A good first AID guide will give the foreman the necessary information for first AID treatment of the injured person. In case of handling preservative chemicals the foreman will follow correctly the manufacturer's instruction for safety and first AID.

12.0 OTHER STANDARDS

The performance requirements of inspection, evaluation and preservative treatment of standing wood poles of BREB based on other internationally recognized standards are acceptable only if the requirements of such standards are equivalent to or exceed the requirements quoted in this standard.

13.0 BIBLIOGRAPHY OF REFERENCE STANDARDS

The following listed specifications are pertinent to this specification except for modifications to them that have been made in the text of this specification.

(1) BREB Standard for Wood Poles: Publication 460-1988.

(2) AWPA M13-72: "A Guide Line For The Physical Inspection of Poles In Service".

(3) Florida Power Corporation's Pole inspection and Treatment Specification, July 1, 1988.

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(4) "Methods for Inspection of Standing Wood Poles in Overhead Lines", Edison Electric Institute's Publication Number 59-74, 1959.

(5) REA Bulletin 161-Electric 441-1 Telephone, 1957, "Pole Maintenance".

(6) REA Bulletin 161-4, "Pole Inspection and Maintenance", 1974.

(7) "A Method of Sampling a Group of Poles", OSMOSE Wood Preserving Company, Buffalo, New York, 1959.

(8) "Pole Circumference Calculator", OSMOSE Wood Preserving Company, Buffalo, New York, USA.

(9) "Inspection and Treatment of Poles in Service" Forest Research Laboratory, Oregon State University, Corvillis, Oregon, USA.

(10) "Wood Pole Maintenance", Research Bulletin 24, February, 1979, Forest Research Laboratory, Oregon State University, Corvillis, Oregon 97331, USA.

(11) ASPLUNDH'S Manual for Maintenance of Pole in Service

Item-1. may be purchased from the Directorate of Procurement, Bangladesh Rural Electrification board, Nikunja-2, Khilkhet, Dhaka - 1229.

Item-2. may be purchased from the American Wood Preserver's Association (AWPA), P.O. Box 849 Stevensville, Maryland 21666 - USA.

Item-3. is available upon request from the Florida Power Corporation's, Distribution Engineering and Operation's Transmission and Distribution Maintenance Department. 3201-34th Street South St. Petersburg, Florida 33711, USA.

Item-4. may be purchased from the Publisher - Edison Electric Institute, 90 Park Ave, New York, 10016.

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Item-5. and 6. are available upon request from Timber Products Section of , Bangladesh Rural Electrification board (BREB), Nikunja-2, Khilkhet, Dhaka - 1229.

Item-9. and 10. are available upon request from the Forest Research Laboratory, Oregon State University, Corvallis, Oregon 97331 - USA.

Item-11. may be purchased from the ASPLUNDH Pole Treating Division and Tree Expert Company, Blair Mill Road, Willow Grove, Pennsylvania 19090 - USA.

*** NOTE:**

Directly or indirectly the above mentioned Specifications or Manuals were consulted to develop BREB Standard for inspection, Evaluation & Treatment of Standing Wood Poles.

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