NATIONAL ELECTRIFICATION ADMINISTRATION
"The 1st Performance Governance System-Institutionalized National Government Agency"
57 NIA Road, Government Center, Diliman, Quezon City 1100

15 May 2018

MEMORANDUM No. 2018-033

TO : **ALL ELECTRIC COOPERATIVES (ECs)**

SUBJECT : **CONFORMITY OF POLES TO NEA STANDARDS AS TO ITS SPECIFICATIONS AND QUALITY**

WHEREAS, Republic Act 10121 otherwise known as the Philippine Risk Reduction and Management Act of 2010 institutionalizes policies on disaster risk reduction towards resilient nation;

WHEREAS, the NEA promulgated in 2016 Policy on Resiliency and part of it is the Vulnerability Risk Assessment and Emergency Restoration Planning for the Electric Cooperatives (ECs);

WHEREAS, the NEA Board of Administrators created in 2017 the Office of Disaster Risk Reduction Management Department (ODRRMD) to enhance further its services to the ECs in so far as resiliency of their facilities are concerned;

WHEREAS, the Department of Energy (DOE) in support to Energy Sector promulgated in 2018 the Department Circular No. DC2018-01-0001 "Adoption of Energy Resiliency Planning and Programming of the Energy Sector to Mitigate Potential Impacts of Disasters;

WHEREAS, the Philippines is one of the countries that are prone to natural calamities; and

NOW, THEREFORE, premises considered, the National Electrification Administration (NEA) hereby requires the implementation of "CONFORMITY OF POLES TO NEA STANDARDS AS TO ITS SPECIFICATIONS AND QUALITY" on poles to be procured and used by the ECs on its electric distribution network to ensure that procured and used poles by the ECs conforms to the specifications and the minimum acceptable quality required.

Section 1: Scope

All Electric Cooperatives are enjoined to strictly comply with this Memorandum.

Section 2: Objective

Prepare ECs' electric distribution system design in conformity with the "Build Back Better" scheme.

Section 3: Implementation

1. The EC's procurement of poles whether made of wood, concrete or steel shall be specified based on the NEA standards or based on acceptable standard in the absence of NEA Standards;

2. The EC shall ensure that all the procured, delivered, and accepted poles whether made of wood, concrete, steel are verified as to its conformity to required specifications and quality;

3. Acceptance in accordance with the NEA standards or based on acceptable industry standard in the absence of NEA standard prior to delivery from the manufacturer's plant/warehouse to the EC's warehouse/office shall be conducted by the manufacturer and witnessed by a technically knowledgeable EC representatives to ensure that it conforms to the EC's requirements;

4. Upon delivery of the procured poles to the EC's warehouse, the EC shall validate, measure, identify mark and observe any defects incurred due to handling. The EC may re-test the poles prior to acceptance;

5. The procurement, delivery, acceptance, and checking of poles must be supported by documents duly signed by those involved in the process; and

6. NEA will conduct random inspection as to ECs' conformity to this Memorandum.

Section 4: Responsibilities

1. It is the responsibility of the ECs General Manager to ensure that the poles procured strictly complies with the NEA standards based on the specifications contained in the NEA Engineering Bulletin DX 2211, 2212 and DX 2213 (copy attached);

2. It is the responsibility of the EC's Technical Manager and Internal Audit Manager to ensure that the poles procured, delivered, and accepted are verified as to its conformity to the NEA standards based on the specifications contained in the NEA Engineering Bulletin DX 2211, 2212 and DX 2213; and

3. It is the responsibility of the EC's Technical Manager to ensure that the poles procured, delivered, accepted, and verified are used based on the NEA "Specifications and Drawings for Distribution Line Construction".

Section 5: Effectivity

This Memorandum shall take effect immediately.

EDGARDO R. MASONGSONG
Administrator

NATIONAL ELECTRIFICATION ADMINISTRATION
Office of the Administrator
NEA-OA252625
5/30/18

NATIONAL ELECTRIFICATION ADMINISTRATION

NEA ENGINEERING BULLETIN DX2211 **September 1993**

SUBJECT: WOOD POLES, STUBS AND ANCHOR LOGS
(Technical Specification TS460)

* *

1. SCOPE:

This specification describes the minimum acceptable quality of wood poles, stubs and anchor logs (hereinafter called poles, except where specifically referred to as stubs or anchor logs) purchased by or for Coop borrowers.

2. GENERAL STIPULATIONS:

Poles shall be warranted to conform to this specifications. If any pole shall be found defective or non-conforming under this specification in any detail except preservative retention, [redacted] shall be replaced as promptly as possible by the producer.

Preservative retention (See Table 7) shall meet specification as a minimum at time of shipment. A reduction in preservation retention of not more than ten (10%) percent will be acceptable within thirty (30) days from date of delivery.

It is the responsibility of the producer to furnish material in a accordance with this specification in its entirety. This responsibility remains notwithstanding any certificate (report) of inspection agency or others. Acceptance of an order for material under this specification shall also constitute evidence of the producer's acceptance of this responsibility.

Poles will be inspected by NEA or their agents at the pole treatment plant for penetration and retention prior to delivery. Poles not meeting the requirements set forth in this specification will be rejected.

No poles shall be shipped for use later than one year following the treatment date. In such cases, the poles should be retreated and reinspected in accordance with NEA specification.

3. MATERIAL REQUIREMENTS:

All poles shall conform to the material requirements shown in appendix A, which are

primarily extracted from ANSI 05.1-1979.

4. PRESERVATIVES:

Preservative shall be selected from one of the following:

A. Creosote: Creosote shall be distillate derived from tar produced by the high temperature carbonization of bituminous coal and shall conform to all requirements of AWPA Standard P1-78 when analyzed in accordance with the methods in AWPA Standard A1-80, sections 2, 3, 4, either 5 or 9 and 6.

B. Pentachlorophenol: Pentachlorophenol shall contain not less than 95 percent chlorinated phenols and shall conform to AWPA Standard P8-77 when analyzed in accordance with AWPA Standard A5-83. The hydrocarbon solvents for introducing the preservative into the wood shall meet the requirements of AWPA Standard P9-81 Types A, B, D, or E determined in accordance with reference ASTM standards for physical properties.

C. Waterborne Preservatives:

1. Ammoniacal Copper Zinc Arsenate (ACZA) shall meet the requirements of AWPA Standard P5-83, when analyzed in accordance with methods in AWPA Standard A2-84, A9-70, A10-82 or A11-83.

2. Chromated copper arsenate (CCA) shall meet the requirements of one of the formulations given in AWPA Standard P5-83, sections 4, 5 or 6 and 10 and AWPA Standard C4-81. Tests to establish conformity shall be made in accordance with AWPA Standard A2-84, A9-70, A10-82 or A11-83.

3. Determination of the required pH of treating solution of the waterborne salts shown in AWPA Standards P5-83, section 10, shall be determined in accordance with AWPA Standard A2-82, section 9.

4. Waterborne preservatives are available either as oxides which form non-ionizing chemical compounds in the wood, or as salts which leave ionizing compounds as well as non-ionizing compounds in the wood. Salt formulations of a waterborne preservative are more corrosive to metal than the oxide formulations and may cause surface deposits. Unless otherwise specified in the purchase order, the oxide formulation of waterborne preservatives shall be supplied. If visible surface deposits appear on the wood within the 1-year guarantee period, it shall not be in compliance with this specification and shall be replaced by the producer.

5. Douglas fir and western larch poles shall not be treated with CCA preservatives.

6. Materials treated with waterborne preservatives shall be free of visible surface deposits.

5. PRESERVATIVE TREATMENT:

A. Conditioning Prior to Treatment

1. Poles (see table 1, appendix A) which are partially seasoned by natural air circulation shall be air dried within the limits of paragraph 4.1.2.1, of Appendix A. Extreme care shall be taken to assure that air seasoned poles do not have pretreatment decay in them (refer also to paragraph 4.2.2 of appendix A). All poles in this category shall be further artificially conditioned prior to treatment by kiln drying.

2. Poles which are partially seasoned by natural air circulation or shed drying shall be further conditioned by kiln drying.

B. Treatment (Pressure Process):

All poles treated by this process shall be treated in a cycle in which the temperatures and pressures shown in the following paragraphs, are not exceeded. These pressures and temperatures shall be recorded on a recording chart and shall be verified by visual observations of the direct reading gauges, at least hourly throughout the treating cycle by a qualified representative of the treating plant and/or independent inspector.

Preservative treatment shall not exceed 120 degrees F for CCA, 150 degrees F for ACA/ACZA and 210 degrees F for Creosote and Penta.

Impregnation pressure shall not exceed 200 psi, except for Red Pine and Douglas Fir (coast) for which the pressure shall not exceed 150 psi.

All poles treated with waterborne salts shall be by full cell process as described in AWPA Standards CI-82 and C4-81 except as modified by the provisions of ANSI 05.1-1979.

C. Treatment (Thermal Process), Full-length Treatment: Western larch, Alaska yellow cedar, lodgepole pine.

1. All poles treated by this process shall be adequately seasoned by natural and/or artificial methods prior to treatment so that specification requirements for penetration and retention are met.

2. The temperature of the preservative during the hot oil phase shall not exceed 235°F.

D. Results of Treatment:

1. Penetration and retention of preservative shall be tested on borings taken at any point on the pole periphery approximately within the zone 1 foot above to 1 foot below the brand on all species of poles.

2. Retention of preservative shall be not less than that specified in table 7, as determined by:

   a. Creosote by AWPA Standard A6-83.

   b. Penta by AWPA Standard A5-83, lime ignition or copper pyridine. Copper pyridine method is required when timber may have been in contact with salt water, and for all species native to the Pacific coast region.

   c. Salts by test in accordance with the recognized standards methods for chromium, copper, zinc, and arsenic ions listed in AWPA Standards A2-84, A7-75, A9-70, A10-82 or A11-83.

3. Penetration of preservative shall not be less than that specified in table 7. When testing, the sampling will be as follows:

   a. For poles with a circumference of less than 37.5 inches at 6 feet from butt:

      (1) Bore 20 percent of poles in a charge or 20 poles from charge, whichever is greater; accept if 100 percent conform; otherwise bore all poles.

      (2) Re-treat the charge if more than 15 percent of the borings are found to be nonconforming.

      (3) Re-treat all nonconforming poles found in the penetration sampling if 15 percent or less fail the requirements.

      (4) Re-treated poles shall be 100 percent tested for penetration boring. Poles which are still nonconforming after the second re-treatment, shall be permanently rejected.

b. For poles with a circumference of 37.5 inches or more at 6 feet from the butt:

(1) Forty-five feet and shorter - bore each pole and retreat only those found to be nonconforming unless more than 15 percent fail; in which case re-treat the entire lot.

(2) Fifty feet and longer - bore each pole twice at 90 degrees apart approximately in the same plane around the pole; and accept only those pole conforming to the penetration requirement in both borings.

(3) Nonconforming poles shall be re-treated and 100 percent retested for penetration. Poles which are still nonconforming after a second re-treatment shall be permanently rejected.

4. Penetration depth shall be measured along a boring from the outer end toward the inner end for a distance throughout which there is continuous preservative penetration as indicated by evidence of preservative in each annual ring included.

5. When poles which have been deep incised or radial drilled are bored for penetration and/or retention testing, the borings shall be taken midway on a diagonal between an incision or hole and an incision or hole in the next vertical row above or below.

E. Re-treatment: Poles may be re-treated only twice.

1. Creosote and Penta - Re-treatment of reserve treated stock poles shall be by submersion in hot preservative (creosote or pentachlorophenol-petroleum solution) for not less than 10 minutes under 25 pounds per square inch gauge pressure or not less than 30 minutes at atmospheric pressure.

2. Waterborne Preservatives - Poles which require re-treatment shall be air dried sufficiently to accept re-treatment. Re-treatment shall be within original treatment limitations.
Re-treated poles shall conform fully to all the requirements of this specifications; otherwise they shall be permanently rejected.

Re-treated poles shall have a letter "R" die-stamped, hammer-stamped or burn-branded in the sawed butt surface following the charge number to indicate that the poles have been re-treated.

6. DRAWINGS:

The attached drawings (801 & M-20) show in detail the framing (gains and bolt-hole) for poles ordered under this specifications. Poles should be ordered by Drawing Number, and should included any desired detail not shown on this drawings.

7. RELATED SPECIFICATIONS:

The following listed specifications may be considered as pertinent to this specification subject to the restrictions in the paragraph under "Scope".
ANSI 05.1-1979 American National Standard Specifications and Dimensions for Wood Poles

ANSI/ASTM D9-76e American National Standard Definitions of Terms Relating to Timber

May be purchased from: American National Standards Institute, Inc.
1430 Broadway New York,
New York 10018

AWPA C1-82 Standard for Preservative Treatment by Pressure Processes - all timber products.

AWPA C4-81 Standard for the Preservative Treatment of Poles by Pressure Processes

AWPA C10-73 Lodgepole Pine Poles - Preservative Treatment by Full-Length Thermal Process

AWPA P1-78 Standard for Coal Tar Creosote for Land and Fresh Water Use

AWPA P5-83 Standards for Water-Borne Preservatives

AWPA P8-77 Standards for Oil-Borne Preservatives

AWPA P9-77 Standards for Solvents for Organic Preservative Systems

AWPA M1-76 Standard for the Purchase and Preservations of Forest Products

AWPA M2-83 Standard Instructions for the Inspection of Preservative Treatment of Wood

AWPA M3-81 Standard Quality Control Procedures for Wood Preserving Plants

AWPA M4-80 Standard Instructions for the Care of Preservative Treated Wood Products

AWPA A1-80 Standards Methods for Analysis of Creosote and Oil-Type Preservatives

AWPA A2-82 Standards Methods for Analysis of Water-Borne Preservatives and Fire Retardant Formulations

AWPA A3-83 Standard methods for Determining Penetration of Preservatives and Fire Retardants

AWPA A5-83 Standard Methods for Analysis of Oil-Borne Preservatives

AWPA A6-83 Method for the Determination of Water and Oil-type Preservatives in Wood

AWPA A7-75 Wet Ashing Procedure for Preparing Wood for Chemical Analysis

AWPA A9-70 Standard Method for Analysis of Treated Wood and Treating Solutions by X-ray Emission Spectroscopy

AWPA A10-82 Analysis of CCA Treating Solutions and CCA Treated Wood by Colorimetry

AWPA A11-83 Analysis of Treated Wood and Treating Solutions by Atomic Absorption Spectroscopy

May be purchased form: American Wood Preservers' Association (AWPA)
P. O. Box 849
Stevensille, Maryland 21666

APPENDIX A
Material Requirements

1. SCOPE:

The material in Appendix A is reprinted from the American National Standards Institute (ANSI) Standard 05.1-1979, "American National Standard Specifications and Dimensions for Wood Poles." Copies of ANSI 05.1-1979 may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York.

2. DEFINITIONS:

The following definitions shall apply to the terms used in this standard:

a. Air Seasoning: Drying by the use of air where the air temperature is not more than 140°F either in the open or under cover.

b. Check: The 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.

c. Compression Wood: Abnormal wood formed on the lower side of branches and inclined trunks of softwood trees. Compression wood is identified by its relatively wide annual rings, usually eccentric; relatively large amount of summerwood, sometimes more than 50 percent of the width of the annual rings. Compression wood, compared with normal wood, shrinks excessively lengthwise.

d. Cross Break: A separation of the wood cells across the grain. Such breaks may be due to internal strains resulting from unequal longitudinal shrinkage or to external forces.

e. Dead Streak: An area, devoid of bark, resulting from progressive destruction of the growth cells of wood and bark at the edge of the streak. On a pole, a dead streak is characterized by a discolored weathered appearance and by lack of evidence of overgrowth along the edges of the deadened surface.

f. Decay: The decomposition of wood substance by fungi.

1. Decay, Advanced (or Typical): The older stage of decay in which the destruction is readily recognized because the wood has become punky, soft and spongy, stringy, ring-shaked, pitted, crumbly, or in poles not stored or rafted in water, is in a soggy condition. Decided discoloration or bleaching of the rotted wood is often apparent.

2. Decay, Incipient: The early stage of decay that has not proceeded far enough to soften or otherwise perceptibly impair the hardness of the wood. It is usually accompanied by a slight discoloration or bleaching of the wood.

3. Decayed Knot: A knot containing decay. Two types of decayed knot are recognized.

Type I - Knots containing soft or loose fibers (decay) which may extend the full length of the knot into the pole and which are associated with heart rot.

Type II - Knots containing soft or loose fibers (decay) which are not associated with heart rot.

g. Face of Pole: The concave side of greatest curvature in poles with sweep in one plane and one direction, or the side of greatest curvature between groundline and top in poles having reverse or double sweep.

h. Ground Line Section: That portion of a pole between 1 foot above and 2 feet below the ground line, as defined in the pole dimension tables.

i. Hollow Heart: A void in the heartwood caused by decay or insect attack.

j. Hollow Pith Center: A small hole at the pitch center of the trunk or of a knot caused by disintegration of the pith (small soft core occurring in the structural center of tree or branch).

k. Insect Damage: Damage resulting from the boring into the pole by insects or insect larvae. Scoring or channeling of the pole surface is not classed as insect damage.

l. Kiln Drying: Drying by the use of heated air in batch or progressive-type kilns.

m. Knot Diameter: The diameter of a knot on the surface of the pole measured in a direction at right angles to the lengthwise axis of the pole. The sapwood as well as the heartwood portion of a knot shall be included in the measurement.

n. Red Heart: A condition caused by a fungus, Fomes pini, that occurs in the living tree. It is characterized in the early stages of infection by a reddish or brownish color in the heartwood; known as "firm red heart". Later the wood of the living

tree disintegrated (decays) in small, usually distinct, areas that develop into whiteline pockets.

o. Sap Stain: A discoloration of the sapwood, caused by the action of certain molds and fungi, that is not accompanied by softening or other.

p. Scar: A depression in the surface of the pole resulting from a wound where the living tree has not compartmentized the wound and reestablished the normal cross section of the pole.

q. Scar, Turpentine Acid Face: An area in the lower portion of a Southern Pine pole where back hack removal with acid applied has caused resin to flow. No removal of sapwood has occurred.

r. Scar, Turpentine Cat Face: A depression in the surface of a Southern Pine pole resulting from a wood hack into the sapwood, where the tree has not compartmentized the wound and reestablished the normal cross section of the pole.

s. Shake: A separation along the grain, the greater part of which occurs between the rings of annual growth.

t. Short Crook: A localized deviation from straightness which, within any section 5 feet or less in length, is more than 1/2 the mean diameter of the crooked section (see fig. 1, diagram 3).

u. Spiral - Grained (Twist-Grained) Wood: Wood in which the fibers take a spiral course about the trunk of a tree instead of a vertical course. The spiral may extend in a right-hand or left-hand direction around the tree trunk. Spiral grain is a form of cross grain.

v. Split: A lengthwise separation of the wood due to the tearing apart of the wood cells.

w. Sweep: Deviation of a pole from straightness (see figure 1, diagrams 1 and 2).

3. POLE CLASSES:

Poles meeting the requirements of this standard are grouped in the classes identified in tables A through E and tables 3 through 6, based on their circumference measured 6 feet from the butt. Poles of a given class and length are designed to have approximately the same load carrying capacity regardless of species.

4. MATERIAL REQUIREMENTS:

4.1 General

4.1.1 Species: See table 1

4.1.2 Conditioning, Seasoning, and Treatment Limitations:

4.1.2.1 Air seasoning shall be in conformance with this specification for preservative treatment without developing pretreatment decay.

All air seasoned poles shall be conditioned prior to or during treatment so that the pith center of the pole shall have been heated for at least 2 hours at a temperature of not less than 150°F. (Heat transfer usually requires 1 hour for each inch of diameter at 150°F).

Poles to be salt treated shall be kiln dried prior to treatment. Kiln dried poles shall be treated within 1 month from the time they are removed from the kiln.

4.1.2.2 Kiln Drying: Where kiln drying is employed on southern pine, red pine, jack pine, lodgepole pine, Douglas fir (coast) and western larch, the maximum dry bulb temperature shall be increased gradually and shall not exceed 170°F. In compartment kilns operating at temperatures up to 170°F, the maximum wet bulb depressions shall not exceed 50°F with the exception that during the first 24 hours there is no limitation on wet bulb depression. In progressive-type kilns operating at temperatures up to 170°F, the maximum wet bulb depression shall not exceed 50°F in the body of the kiln and 90°F at the entrance to the kiln.

Exception: Drying over 170°F is permitted for southern pine, lodgepole pine, Douglas fir (coast) and western larch species. The maximum dry bulb temperature shall not exceed 230°F for these species. For dry bulb temperatures over 200°F, the wet bulb depression shall be not less than 50°F with the exception that during the first 24 hours there is no limitation on wet bulb depression.

4.1.3 Solvent Recovery: When poles of any species have been treated with a system using an organic solvent-based preservative solution, a solvent recovery cycle of not over 15 hours at a maximum temperature of 225°F is permitted provided each pole before treatment has a maximum moisture content 25 percent when measured with a resistance-type moisture meter

(calibrated to the basis of oven dry weight moisture content) with insulated pins at 2.0 inches form the surface at mid-length.

4.1.4 Rate of Growth: The average rate of growth measured on the sawed butt surface in the outer 2 inches of poles having a circumference of 37.5 inches or less at 6 feet from the butt, and in the outer 3 inches of poles having a circumference of more than 37.5 inches at 6 feet form the butt, shall be not less than six rings per inch. Exception: Poles with four and five rings per inch are acceptable if 50 percent or more summerwood is present.

As an alternative, the ring count and summerwood measurements mentioned above may be made on an increment core taken at 6 feet from the butt directly above the place where the average rate of growth is indicated on the butt surface.

4.2 Prohibited Defects:

4.2.1 Cross breaks (cracks).

4.2.2 Decay, except as permitted for firm red heart in 4.3.1, defective butts in 4.4.4 and decayed knots in 4.4.6 When conditions indicate on distribution poles, and on all transmission poles (in the white), a boring to the center of the pole should be taken at approximately 1 foot above the groundline, at midpoint, near (within 2 inches) a check or at any other suspicious area. The borings should be examined by the quality control supervisor and the inspector for any signs of decay.

Where a question of possible decay and/or infection remains, the pole should be further tested using techniques such as the Pilodyn, Shigometer,culturing or microscopic examination. Evidence of fungal fruiting bodies and/or mycelium or/in a piece of wood shall be considered as evidence of decay and the piece of wood shall be permanently rejected as nonconforming.

4.2.3 Dead streaks

4.2.4 Holes, other than drilled holes provided for in the specification, open or plugged, except holes for test purposes, which shall be plugged with treated plugs.

4.2.5 Hollow butts or tops, except as permitted under hollow pith centers and defective butts.

4.2.6 Marine borer damage.

4.2.7 Nail, spikes and other metal not specifically authorized by the purchaser.

4.3 Permitted Defects:

4.3.1 Firm Red Heart: Firm red heart not accompanied by softening or other disintegration (decay) of the wood is permitted.

4.3.2 Hollow pith Centers: Hollow pith centers in tops or butts and in knots are permitted in poles that are to be given full-length treatment.

4.3.3 Sap Stain: Sap stain that is not accompanied by softening or other disintegration (decay) of the wood is permitted.

4.3.4 Scars: Turpentine acid face scars are permitted anywhere on the pole surface.

4.4 Limited Defects:

4.4.1 Bark Inclusions: Depressions containing bark inclusions shall be not more than 2 inches in depth, measures from the surface of the pole.

4.4.2 Compression Wood: The outer 1 inch of all poles shall be free from compression wood visible on either end.

4.4.3 Dead Streaks: A single, sound dead streak is permitted in Western Red Cedar and Northern White Cedar, provided the greatest width of the streak is less than 1/4 of the cicumference of the pole at the point of measurement.

4.4.4 Defective Butts: Hollowing in the butt caused by "splinter pulling" in felling the tree is permitted, provided that the areas of such a hollow is less than ten percent (10%) of the butt area.

4.4.5 Insect Damage: Insect Damage, consisting of holes 1/6 inch or less in diameter, or surface scoring or channeling is permitted. All other forms of insect damage are prohibited, except those associated with hollow heart.

4.4.6 Knot: The diameter of any single knot and the sum of knot diameters in any 1-foot section shall not exceed the limits of table 2. Knots shall not occur within two (2) ft. above and or below the groundline.

Type II "decayed knots" are permitted.

4.4.7 Scars (Cat Face): A scar is the result of injury to the living tree which has begun to compartmentize and contain the injury. This provision does not refer to damage to the tree (pole) after it has been cut. No pole shall have a scar or turpentine cat face located within 2 feet of the ground line. Turpentine scars need be trimmed only to the extent necessary for examination for evidence of fungus infection and insect damage. Other sound scars are permitted elsewhere on the pole surface, provided they are smoothly trimmed and do not interfere with the cutting of any gain and provided that:

(1) The circumference at any point on trimmed surfaces located between the butt and 2 feet below the ground line is not less than the minimum circumference specified at 6 feet from the butt for the class and length of the pole; and

(2) The depth of the trimmed scar is not more than 2 inches, if the diameter is 10 inches or less, or 1/5 the pole diameter at the location of the scar if the diameter is more than 10 inches.

4.4.8 Shakes: Shakes in the butt surface which are not closer than 2 inches to the side surface of the pole are permitted, provided they do not extend to the ground line. Shakes or a combination of connected shakes which are closer than 2 inches to the side surface of the pole are permitted, provided they do not extend farther than 2 feet from the butt surface and do not have an opening wider than the 1/8 inch. Shakes in the top surface are permitted in poles that are to be given full-length preservative treatment, provided that the diameter of the shake is not greater than 1/2 the diameter of the top of the pole and is not closer than 2 inches from the surface.

4.4.9 Shape: Poles shall be free from crooks. A pole may have sweep subject to the following limitations.

(1) Where sweep is in one plane and one direction only:

(a) For poles 50 feet and shorter of all species, a straight line joining the surface of the pole at the ground line and the edge of the pole at the top in 90 percent or more of an inspection lot shall not be distant from the surface of the pole at any point by more than one 1 inch for each 10 feet of length between these points. In the remainder of the inspection lot (10 percent), the poles may have a deviation

of 1 inch for each 6 feet of length when measured as above.

(b) Poles 55 feet and longer shall meet the 1-inch-in-10-feet requirement in 75 percent or more of an inspection lot. In the remainder of the lot (25 percent), the pole may have a deviation of 1 inch for each 6 feet of length when measured as above.

(2) Where sweep is in two planes (double sweep), or in two directions in one plane (reverse sweep), a straight line connecting the midpoint at the ground line with the midpoint at the top shall not at any intermediate point pass through the surface of the pole (see figure 1, diagram 2).

4.4.10 Spiral Grain: Spiral grain (twist grain) is permitted as follows:

Length of Pole (Feet)	Maximum Twist of Grain Permitted
30 and shorter	1 complete twist in any 10 ft.
35-45, inclusive	1 complete twist in any 16 ft.
50 and longer	1 complete twist in any 20 ft.

4.4.11 Splits and Checks:

(1) In the top: A split or a combination of two single checks (each check terminating at the pith center and separated by not less than 1/6 of the circumference) having one or both portions located in a vertical plane within 30 degrees of the top bolt hole shall not extend downward along the pole more than 12 inches. (Two checks or approximately the same width, each check terminating at the pith center and separated by 1/2 inch or less of wood fiber at any point on the pole circumference, shall be considered as a single continuous check).

(2) In the Butt: A split or combination of two single checks, as defined in 4.4.1 (1), in its entirety, shall not extend upward along the pole more than 2 feet.

(3) Checks located two (2) ft. above and below the groundline portion shall not be permitted.

(4) The manufacturer may use bands, caps or cats of galvanized steeling to reduce the natural splitting of the species.

5. DIMENSIONS:

For dimensions of particular species of poles, see tables 3 through 6 and A through E. For dimensions of stubs and anchor logs, see tables 8 and 9, respectively.

5.1 Length: Poles less than 50 feet in length shall be not more than 3 inches shorter or 6 inches longer than nominal length. Poles 50 feet or more in length shall be not more than 6 inches shorter or 12 inches longer than nominal length.

5.2 Circumference: The minimum circumference at 6 feet from the butt and at the top, for each length and class of pole, are listed in table A through E and 3 through 6. The circumference at 6 feet from the butt of a pole shall be not more than 7 inches or 20 percent larger than specified minimum, whichever is greater.

The top dimensional requirements shall apply at a point corresponding to the minimum length permitted for the pole.

5.3 Classifications: The true circumference class shall be determined as follows: Measure the circumference at 6 feet from the butt. This dimension will determine the true class of the pole, provided that its top (measured at the minimum length point) is larger enough. Otherwise, the circumference at the top will determine the true class, provided that the circumference at 6 feet from the butt does not exceed the specified minimum by more than 7 inches or 20 percent, whichever is greater.

6. MANUFACTURING REQUIREMENTS:

6.1 Bark Removal: Outer bark shall be completely removed from all poles.

On all poles, no patch of inner bark more than 1 inch wide shall be left on the pole surface between the butt and 2 feet below the ground line.

On poles that are to be given full-length treatment, no patch of inner bark larger than 1 inch wide and 6 inches long shall be left on the pole surface between the butt and 2 feet below the ground line.

NOTE: These provisions are intended to allow an occasional patch of bark and shall not be interpreted to allow numerous patches of bark.

6.2 Sawing: All poles shall be neatly sawed at the top and at the butt along a plane which shall not be out of square with the axis of the pole by more than 2 inches per foot of diameter of the sawed surface. Beveling at the edge of the sawed butt surface not more than 1/12 the butt diameter in width, or an equivalent area unsymmetrically located, is permitted. The sawed surface should be smooth enough to allow the inspector's mark to be clear and legible after treatment.

6.3 Trimming: Completely overgrown knots, rising more than 1 inch above the pole surface, branch stubs, and partially overgrown knots shall be closely trimmed. Completely overgrown knots less than 1 inch high need not be trimmed.

Trimming may be done by shaving machine or by hand.

6.4 Shaving: If shaving is used, the depth of cut shall not be more than necessary to remove inner bark and to trim smoothly and closely all branch stubs and overgrown knots. There shall be no abrupt change in the contour of the pole surface between the ground line and the above-ground sections. The lower 2 feet of poles may be trimmed to remove wood fibers causing butt flare, provided sufficient sapwood remains to obtain customer's minimum penetration requirements.

6.5 Marking and Code Letters: The information in items (1) and (5) below shall be burnbranded legibly and permanently on the pole face or included on a metal tag affixed hereto. The metal tag for the face of the pole shall be round, noncorrosive, tight-fitting and recessed 1/4 inch. It shall be fastened with a barbed or serrated noncorrosive nail.

The information in items (5) and (6) below shall be placed on the sawed butt surface. If so desired by the producer or the purchaser, items (1), (3) and (4) below may also be placed on the sawed butt surface.

(1) The supplier's code or trademark.

(2) Insured warranty or quality assurance mark if applicable.

(3) Plant location and month and year of treatment.

(4) Code letters denoting the pole species, preservative and retention used.

(5) The true circumference-class numeral and numerals showing the length of the pole.

(6) The charge number. (An "R" shall also be die-stamped, hammer-stamped or burnbranded in the sawed butt surface of re-treated poles).

The code letters, not less than 5/8-inch burnbranded, and not less than 1/8-inch high if on a metal tag, designating the pole species preservative used,shall be as follows:

Species	Code Letters
A. Foreign Wood	
Alaska yellow cedar	YC
Douglas fir (coast)	DF
Larch (western)	WL
Pine	
Jack	JP
Lodgepole	LP
Ponderosa	WP
Radiata (New Zealand)	RP
Red (Norway)	NP
Southern	SP
Loblolly	
Longleaf	
Shortleaf	
Slash	
Finish/Scott Pine	
B. Philippine Wood	
Apitong	Ap
Bagtikan	Ba
Toog	To
Benguet Pine	P
Mindoro Pine	MP
Red Lauan	RL
Tangile	Ta
Pahutan	Pa
Almon	Al
Manggasinoro	Mgs
Makaasim	Ma
Manggachapui	mg

Preservatives	Code Letters
Creosote	C
Pentachlorophenol-Petroleum (Heavy Solvent)	PA
Penta-LPG Cellon	PB
Penta-Methylene Chloride (Dow Process)	PD
Penta-Water Dispersed	PE
Ammoniacal Copper Arsenate	SB
Ammoniacal Copper Zinc Arsenate	SZ
Chromated Copper Arsenate	
Type A	SC
Type B	SJ
Type C	SK
Retention	
Extra Heavy	XH

The bottom of the brand or mark shall be placed squarely on the face of the pole and at 10 feet $\pm$ 2 inches from the butt of poles 50 feet or less in length and at 14 feet $\pm$ 2 inches from the butt of poles 55 feet or more in length or as otherwise specified in the purchase order. Anchor logs shall have the brand or mark at the midpoint and the designation for length and diameter.

The following details shall be included in the brand or disk on the face of the pole or stub;

a. The Supplier's code or trademark
b. The plant location, month & year of treatment
c. Code letters denoting pole specie and preservative used.
d. Numerals indicating the length and class of poles.

6.6 Framing

6.6.1 All distribution poles shall be bored, gained and cut to length prior to final treatment.

6.6.2 All framing shall be in accordance with the attached drawings or with the drawings which accompany the order.

6.6.3 When gains are required on one side only, they shall be cut on the face of the pole, and the gained surfaces shall be in approximately parallel planes. Transmission poles (e.g., poles 50 feet or longer) may be treated undrilled.

6.6.4 Anchor logs shall be bored as required by the order for them.

6.7 Incising or Drilling: Incising or drilling shall be cleanly done to prevent tearing or excessive shattering of fibers. Incisions shall be along (in line with) the axis of the pole.

7. STORAGE AND HANDLING:

7.1 Storage: When it is necessary to hold poles in storage, they shall be stacked on treated or other nondecaying skids, stickers, etc., of such dimensions, and so arranged, as to support the poles without producing noticeable distortion of any of them. The height of the pole stack shall be limited to avoid damage to poles on the bottom layers. All wood skids, stickers, etc., shall be treated.

Poles shall be piled and supported in such a manner that all poles are, at any point, at least 1 foot above the general ground level and any vegetation growing thereon. Stacks of poles shall not be allowed to settle at any point to less than 1 foot above the ground or any adjacent vegetation growing thereon. No decayed or decaying wood shall be permitted to remain underneath stored poles or in the yard area adjacent to the stored poles. Unseasoned poles shall not be dead piled at any time for air seasoning. This restriction does not apply to short term piling associated with normal manufacturing procedures. Where special conditions exists, such as in arid areas, a waiver to this dead piling restriction may be requested from NEA.

7.2 Handling: Poles shall not be dragged along the ground. Cant hooks, pole thongs, or other pointed tools shall not be applied to the ground line section of any pole.

7.3 Mechanical Damage: Poles are not acceptable if they contain indentations attributed to loading or handling slings that are 1/4 inch or more deep over 20 percent or more of the pole circumference, or more than 1/2 inch deep at any point. Other indentations or abrasions, for example, forklift damage, chain-saw damage, etc., shall not be more than 1/10 the pole diameter at the point of damage up to a maximum of one (1) inch. Such damage is permitted in an oversized section, where the excess of wood shall be taken into consideration in evaluating the effects of the damage. In any case, the remaining circumference for a given class is still required to be not less than the specification minimum.

TABLE 1
GENERAL REQUIREMENTS

TREATMENT GROUP	GENUS AND SPECIES	FIBER STRESS (psi)
A. Treatment Group A (Air Seasoned)		
Pine, Jack	Pinus Banksiana	6,600
Pine, Lodgepole	Pinus Contorta	6,600
Pine, Red (Norway)	Pinus Resinosa	6,600
Cedar, Alaska Yellow	Chamaecyparis Nootkatensis	7,400
B. Treatment Group D (Kiln Drying)		
Douglas Fir (Coast)	Pseudotsuga Menziesii	8,000
Larch, Western	Larix Occidentalis	8,400
Pine, Jack	Pinus Banksiana	6,600
Pine, Lodgepole	Pinus Contorta	6,600
Ponderosa	Ponderosa	6,000
Radiata (New Zealand)	Radiata	6,000
Pine, Red (Norway)	Pinus Resinosa	6,600
*Pine, Mindoro	Pinus Merchusii Junetod	8,090
Finish/Scott Pine	Pinus Sylvestris	7,800
Pine, Southern		8,000
Loblolly	Pinus Taeda	
Longleaf	Pinus Palustris	
Shortleaf	Pinus Echinata	
Slash	Pinus Elliottii	
*Tangile	Shorea Polysperma (Blanco)	8,090
*Almon	Merr	6,900
*Manggasinoro	Shorea Almon Foxw.	6,900
*Red Luan	Shorea Philippiicasis	7,600
*Bagtikan	Brandis	9,100
*Apitong	Shorea Negrosensis Foxw.	9,100
*Manggachapui	Parashorea Plicata	11,100
*Makaasim	Diptero Carpuz	11,100
*Narig	Hopea Squamata Herr	11,100
*Narig, thick leafed	Syzigium Nitidum	11,100
	Vatica Manggachapui Blanco	
	Vatica Pachyphylla Merr.	

Note:* Philippine Wood Species

TABLE 2
LIMITS OF KNOT SIZE

Maximum Sizes Permitted				
Length of Pole	Diameter of any Single Knot (Inches)		Sum of Diameters of All knots Greater Than 0.5 Inch. in Any 1-Foot Section (Inches)	
	Classes H6 to 3	Classes 4 to 0	Classes H6 to H1	Classes 1 to 10
45 feet and shorter Lower half of length Upper half of length	 3 5	 2 4	8*	8*
50 feet and longer Lower half of length Upper half of length	 4 6	 4 6	1/3 of the circumference in any 1 foot section or 14 inches, whichever is less*	10*

* Both upper and lower halves.

NOTE: See section 3 and tables A through E and 3 to 6 pole classes.

TABLE 3
Dimension of Jack Pine, Lodgepole Pine, Red Pine, Redwood, Sitka Spruce, Western Fir, and White Spruce Poles (Based on Fiber Stress of 6,600 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	36.0	33.5	31.0	29.0	27.0	25.0	23.0	20.0	15.5
30	5.5	39.0	36.5	34.0	31.5	29.0	27.0	25.0	21.0	–
35	6	41.5	38.5	36.0	33.5	31.0	28.5	26.5	–	–
40	6	44.0	41.0	38.0	35.5	33.0	30.5	–	–	–
45	6.5	46.0	43.0	40.0	37.0	34.5	32.0	–	–	–
50	7	48.0	45.0	42.0	39.0	36.0	–	–	–	–
55	7.5	49.5	46.5	43.5	40.5	–	–	–	–	–
60	8	51.5	48.0	45.0	42.0	–	–	–	–	–
65	8.5	53.0	49.5	46.0	43.0	–	–	–	–	–
70	9	54.5	51.0	47.5	44.5	–	–	–	–	–
75	9.5	56.0	52.5	49.0	–	–	–	–	–	–
80	10	57.5	54.0	50.5	–	–	–	–	–	–

*The figures in this column are intended for use only when a groundline is necessary in order to apply requirements relating to scars, straightness, etc.

NOTE: Classes and lengths for which circumferences at 6 feet from the butt are listed in boldface type are the preferred standard sizes. Those shown in light type are included for engineering purposes only.

Redwood, Sitka Spruce, Western Fir, and White Spruce are not permitted under this specification.

TABLE 4

Dimension of Ponderosa Pine and Radiata Pine (New Zealand) Poles

(Based on Fiber Stress of 6,000 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	37.0	34.5	32.5	30.0	28.0	25.5	24.0	20.5	16.5
30	5.5	40.0	37.5	35.0	32.5	30.0	28.0	26.0	22.0	–
35	6	42.5	40.0	37.5	34.5	32.0	30.0	27.5	–	–
40	6	45.0	42.5	39.5	36.5	34.0	31.5	–	–	–
45	6.5	47.5	44.5	41.5	38.5	36.0	33.0	–	–	–
50	7	49.5	46.5	43.5	40.0	37.5	–	–	–	–
55	7.5	51.5	48.5	45.0	42.0	–	–	–	–	–
60	8	53.5	50.0	46.5	43.5	–	–	–	–	–
65	8.5	55.0	51.5	48.0	45.0	–	–	–	–	–
70	9	56.5	53.0	49.5	46.0	–	–	–	–	–
75	9.5	58.0	54.5	51.0	–	–	–	–	–	–
80	10	59.5	56.0	52.0	–	–	–	–	–	–

* The figures in this column are intended for use only when a definition of groundline is necessary in order to

requirements relating to scars, straightness, etc.

NOTE: Classes and lengths for which circumferences at 6 feet from the butt are listed in boldface type are the preferred standard sizes. Those shown in light type are included for engineering purposes only.

Western Hemlock is not permitted under this specification.

TABLE 5
Dimension of Alaska Douglas Fir and Southern Pine Poles
(Based on Fiber Stress of 8,000 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	33.5	31.5	29.5	27.5	25.5	23.0	21.5	19.5	15.0
30	5.5	36.5	34.0	32.0	29.5	27.5	25.0	23.5	20.5	–
35	6	39.0	36.5	34.0	31.5	29.0	27.0	25.0	–	–
40	6	41.0	38.5	36.0	33.5	31.0	28.5	–	–	–
45	6.5	43.0	40.5	37.5	35.0	32.5	30.0	–	–	–
50	7	45.0	42.0	39.0	36.5	34.0	–	–	–	–
55	7.5	46.5	43.5	40.5	38.0	–	–	–	–	–
60	8	48.0	45.0	42.0	39.0	–	–	–	–	–
65	8.5	49.5	46.5	43.5	40.5	–	–	–	–	–
70	9	51.0	48.0	45.0	41.5	–	–	–	–	–
75	9.5	52.5	49.0	46.0	–	–	–	–	–	–
80	10	54.0	50.5	47.0	–	–	–	–	–	–

* The figures in this column are intended for use only when a definition of groundline is necessary in order to apply requirements relating to scars, straightness, etc.

NOTE: Classes and lengths for which circumferences at 6 feet from the butt are listed in boldface type are the preferred standard sizes. Those shown in light type are included for engineering purposes only.

Inland Douglas fir not permitted under this specification.

Coast Type Douglas fir and Southern Pine permitted under this specification.

TABLE 6
Dimension of Western Larch Poles
(Based on Fiber Stress of 8,400 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	33.0	31.0	29.0	26.5	24.5	23.0	21.0	18.5	14.5
30	5.5	35.5	33.5	31.0	29.0	26.5	24.5	23.0	19.5	–
35	6	38.0	35.5	33.0	31.0	28.5	26.5	24.5	–	–
40	6	40.0	37.5	35.0	32.5	30.0	28.0	–	–	–
45	6.5	42.0	39.5	37.0	34.0	31.5	29.0	–	–	–
50	7	44.0	41.0	38.5	35.5	33.0	–	–	–	–
55	7.5	45.5	42.5	40.0	37.0	–	–	–	–	–
60	8	47.0	44.0	41.0	38.5	–	–	–	–	–
65	8.5	48.5	46.0	42.5	39.5	–	–	–	–	–
70	9	50.0	47.0	44.0	41.0	–	–	–	–	–
75	9.5	51.5	48.0	45.0	–	–	–	–	–	–
80	10	52.5	49.5	46.0	–	–	–	–	–	–

* The figures in this column are intended for use only when a definition of groundline is necessary in order to apply requirements relating to scars, straightness, etc.

NOTE: Classes and lengths for which circumferences at 6 feet from the butt are listed in boldface type are the preferred standard sizes. Those shown in light type are included for engineering purposes only.

TABLE 7
Preservative and Results of Treatment
For Full Length Pressure Treated Poles, Stubs and Anchor Logs

Species	Preservatives Treatment Minimum Retention PCF				All Treatments Standard Test Zone Inches from Surface	Penetration			Brand Symbol	Ground Line Area
	A Creosote	B Penta		Waterborne		Minimum Inches	% of Radius	% of Sapwood		
		Copper Pyridine	Lime Ignition	CCA or ACZA						
Eucalyptus as shown in Table 1	16	1	1.5	1.5	Note D	Note D	-	100	XH	
Southern Pine	16	1	1.25	1.25	0.5 - 3.5	3.5"	-	or 90	XH	
Red Pine	16	1	1.25	1.25	0.1 - 2.5	2.5"	-	or 90	XH	
Finish/Scott Pine, Ponderosa Radiata (New Zealand)	16	1	1.25	1.25	0.1 - 22% of Diam		44	and 95	XH	
Other Local and Foreign Species Shown on Table 1 with fiber stress rating of 8,000 PSI or more.	16	1	1.25	1.25	0.1 - 22% of Diam		44	and 95	XH	

Note A - Test by tolvene extraction

Note B - Copper pyrides method is required when pole may have been in contact with salt water or other chloride, and for all species native to Pacific Coast Region.

Note C - Minimum pounds/cubic foot (pcf) acceptable at time of shipment to the user.

A reduction of 10 percent from the values shown above will be acceptable at destination within 30 days from the date of delivery.

Assays shall be performed by a qualified analyst under the provisions of this specification and NEA Engineering Bulletin DX2510. In the event of the rejection of any poles at destination, NEA and the producers shall be promply notified. The producers may examine the poles at destination within 2 weeks of notification.

Note D Full Sapwood for Eucalyptus 1.25

TABLE 8

Dimension of Stubs
Lodgepole Pine, Red Pine, Jack Pine

	Class of Stub						
Lenth of Stub	1	2	3	4	5	6	7
(feet)	Minimum Top Circumference* (inches)						
10.5	37.0	34.5	32.0	29.5	27.0	25.0	22.5
11	39.5	37.5	34.0	31.5	29.5	26.5	24.0
11.5	42.0	39.0	36.0	33.5	31.0	28.5	26.0
12.5	43.5	40.5	37.5	34.5	32.0	29.5	27.0
13	45.5	42.5	39.5	36.5	33.5	31.0	28.5

Dimension of Stubs
Southern Pine, Douglas Fir (Coast) & Western Larch

	Class of Stubs						
Length of Stub	1	2	3	4	5	6	7
(feet)	Minimum Top Circumference* (inches)						
10.5	36.0	33.5	31.0	28.5	26.5	24.5	22.5
11	38.0	35.5	33.0	30.0	28.0	25.5	23.5
11.5	40.0	37.5	35.0	32.0	29.5	27.0	25.0
12.5	42.0	39.5	36.5	34.0	31.0	28.5	26.5
13	43.5	40.5	37.5	35.0	32.0	29.5	27.0

Maximum circumference not more than these figures plus 4 inches.

TABLE 9

Dimensions of Anchor Logs
Southern Pine, Lodgepole Pine, Red Pine,
Jack Pine, Douglas Fir (Coast) and Western Larch

Designation	F2–1	F2–2	F2–3	F2–4	TA–1–5	TA–1–8
Length (feet)	4'–0"	4'–6"	5'–0"	5'–0"	5'–0"	8'–0"
Diameter (Min)	8"	9"	10"	12"	8"	8"
Boring – as ordered						

TABLE A
Dimension of Makaasim, Manggachapui & Narig
(Based on Fiber Stress of 11,100 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	30.5	28.6	26.7	24.8	22.9	21.2	19.7	17.1	13.6
30	5 – 1/2	32.8	30.8	28.6	26.6	24.6	22.7	21.1	18.5	
35	6	34.8	32.6	30.4	28.3	26.1	24.2	22.4		
40	6	36.8	34.5	32.2	29.9	27.6	25.6	23.7		
45	6 – 1/2	38.4	36.0	33.6	31.2	28.8	26.7			
50	7	39.9	37.4	34.9	32.4	30.0	27.7			
55	7 – 1/2	41.3	38.7	36.1	33.5	31.1				
60	8	42.6	39.9	37.2	34.6	32.0				
65	8 – 1/2	43.9	41.4	38.3	35.6					
70	9	44.4	42.2	39.3	36.6					
75	9 – 1/2	46.2	43.3	40.3	37.4					
80	10	47.2	44.2	41.2						

DX2211.29

DX221.30

TABLE B
Dimension of Apitong, Bagtikan & Toog
(Based on Fiber Stress of 9100 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	32	30	28	26	24	22.5	20.5	18	14
30	5 – 1/2	34.5	32.5	30	28	26	24	22.5	19	
35	6	37	34.5	32.5	30	27.5	26	24		
40	6	39	36.5	34	31.5	29	27	25.5		
45	6 – 1/2	41	38.5	36	33	30.5	28			
50	7	43	40	37.5	34.5	32	29.5			
55	7 – 1/2	44.5	41.5	39	36	33.5				
60	8	46	43	40	37.5	34.5				
65	8 – 1/2	47	45	41.5	38.5					
70	9	48.5	46	43	40					
75	9 – 1/2	50	46.5	44						
80	10	51	48	45						

TABLE C
Dimension of Pahutan, Tangile & Mindoro Pine
(Based on Fiber Stress of 8090 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	33.9	31.8	29.6	27.5	25.4	23.6	21.9	19.1	15.2
30	5 – 1/2	36.4	34.2	31.8	29.6	28.1	25.3	23.5	20.5	
35	6	38.7	36.2	33.8	31.4	30.7	26.8	24.9		
40	6	40.9	38.3	35.7	33.2	33.4	28.4	26.4		
45	6 – 1/2	42.7	40.0	37.3	34.6	35.9	29.6	27.5		
50	7	44.4	41.6	38.8	36.0	38.4	30.8	28.6		
55	7 – 1/2	45.9	43.0	40.1	37.2	40.8	31.8			
60	8	47.4	44.4	41.4	38.4	43.2	32.9			
65	8 – 1/2	48.7	45.7	42.6	39.5	45.5				
70	9	49.0	46.9	43.7	40.6	47.7				
75	9 – 1/2	51.3	48.0	44.8	41.6					
80	10	52.4	49.1	45.8	42.5					

TABLE D
Dimension of Benguet Pine Poles & Red Lauan
(Based on Fiber Stress of 7600 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	34.0	32	30	27.5	25.5	24.0	21.5	19.0	15.0
30	5 – 1/2	36.5	34.5	32	30.0	27.5	25.5	24.0	20.0	
35	6	39.5	36.5	34.0	32.0	29.5	27.5	25.5		
40	6	41.5	39.0	36.0	33.5	31.0	29.0	27.0		
45	6 – 1/2	43.5	41.0	38.5	35.0	32.5	30.0	28.0		
50	7	45.5	42.5	40.0	36.5	34.0	31.5	29.5		
55	7 – 1/2	47.0	44.0	41.5	38.5	35.5	32.5			
60	8	48.5	45.5	42.5	40.0	36.5	34.0			
65	8 – 1/2	50.0	47.5	44.0	41.0	38.0				
70	9	51.5	48.5	45.5	42.5	39.5				
75	9 – 1/2	53.0	49.5	46.5	43.5					
80	10	54.5	51.0	47.5	44.5					

TABLE E
Dimension of Almon, and Manggasinoro
(Based on Fiber Stress of 6900 psi)

Class		1	2	3	4	5	6	7	9	10
Minimum Circumference at top (inches)		27	25	23	21	19	17	15	15	12
Breaking Load (pounds)		4500	3700	3000	2400	1900	1500	1200		
Length of Pole (feet)	Groundline Distance from Butt (feet)	Minimum Circumference at 6 feet from Butt (inches)								
25	5	35.7	33.44	31.27	29.0	26.8	24.81	23.0		
30	5 – 1/2	38.5	35.08	33.6	31.2	28.8	26.6	24.8		
35	6	40.6	38.24	35.61	33.1	30.6	28.3			
40	6	43.1	40.41	37.69	35.0	32.3				
45	6 – 1/2	45.0	42.2	39.18	36.6					
50	7	46.79	43.83	40.88						
55	7 – 1/2	48.42	45.4							
60	8	49.93								
65	8 – 1/2									
70	9									
75	9 – 1/2									
80	10									

DX211.33

DIAGRAM 1 — MEASUREMENT OF SWEEP IN ONE PLANE AND ONE DIRECTION

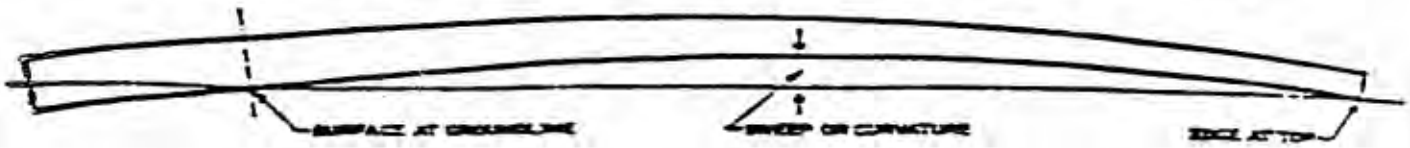
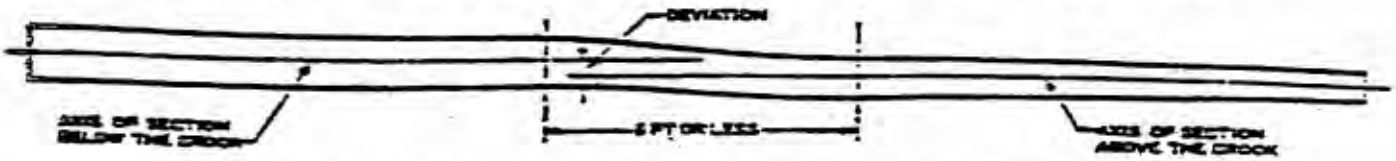
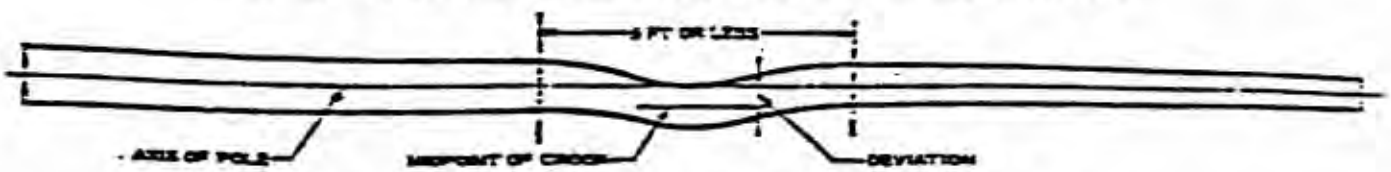


DIAGRAM 2 — MEASUREMENT OF SWEEP IN TWO PLANES (DOUBLE SWEEP) OR IN TWO DIRECTIONS IN ONE PLANE (REVERSE SWEEP)

DIAGRAM 3 — MEASUREMENT OF SHORT CROOK (THREE CASES SHOWN)



CASE 1: WHERE THE REFERENCE AXES ARE APPROXIMATELY PARALLEL



CASE 2: WHERE AXES OF SECTIONS ABOVE AND BELOW THE CROOK COINCIDE OR ARE PRACTICALLY COINCIDENT

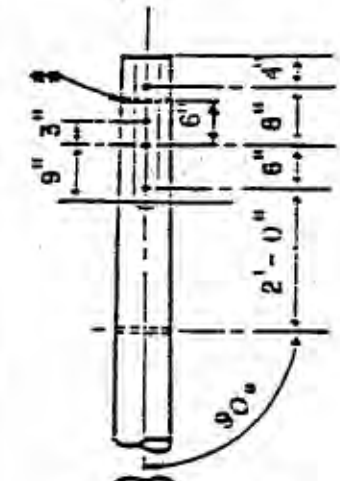
CASE 3: WHERE AXIS OF SECTION ABOVE SHORT CROOK IS NOT PARALLEL OR COINCIDENT WITH AXIS BELOW THE CROOK

NOTE: The three cases shown under Diagram 3 are typical and are intended to establish the principle of measuring short crooks. There may be other cases not exactly like those illustrated.

Fig. 1
Measurement of Sweep and Short Crook in Poles

FIGURE 1

DX2211.34



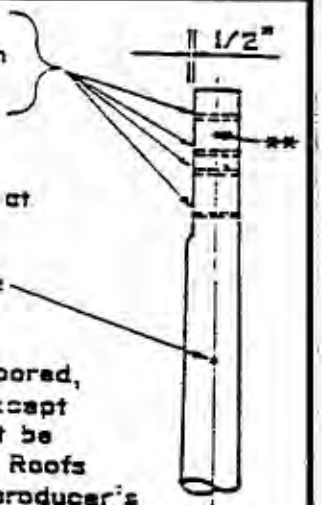
Through-bolt holes must be parallel and in the same plane.

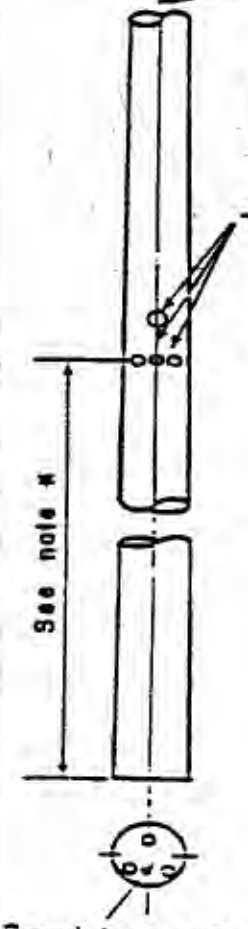
HOLES: Drill 11/16" diameter.

GAINS. Gains are to be flat with plane at right angles to bolt hole.

Neutral bolt hole must be at 90° angle with through-bolt holes.

All poles shorter than 50 feet must be bored, roofed and gained before treatment, except that Class 7 and smaller poles need not be gained unless requested by purchaser. Roofs may be flat or at a 15° angle at the producer's option.





*Bottom of brand or center of metal disk shall be 10'± 1" from pole butt; 14'± 1" mark for poles 55' and longer.

If insured warranted pole, Brand "IW".

Manufacturer's Mark and Date of Treatment, (Month and Year).

Brand with proper length and class.

Brand with species, preservative code and retention.

Tolerance:

Holes

On the gain ± 1/8" from the centerlines of the holes.

On the side opposite the gain ± 1/4" from the centerlines of the holes.

Location – measured from roof
Gain side ± 1/4"
Opposite side ± 1/2"

Diameter ± 1/16"
Gains out of parallel ± 1/2"

** Optional, anti-split bolt hole to be drilled only when so specified by the purchaser.

Brand butt with proper length and class

POLE FRAMING GUIDE

M20

FIGURE 2

DX2211.35

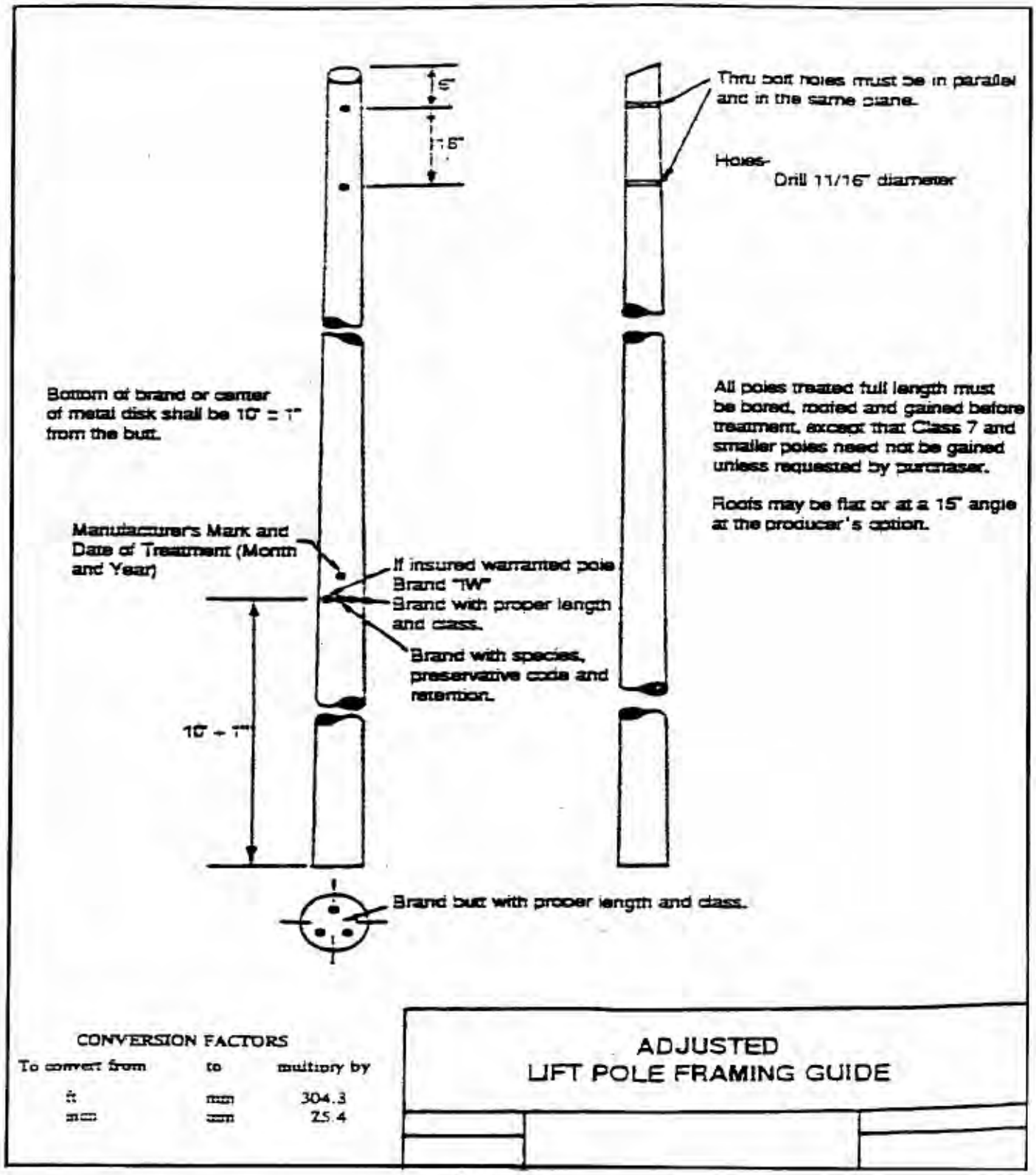


FIGURE 3

DX2211.36

Inspection

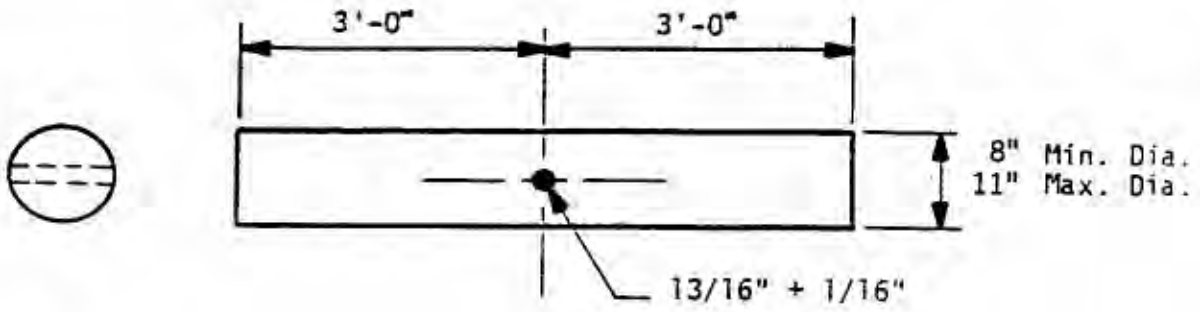


FIGURE 4

Anchor Log

NATIONAL ELECTRIFICATION ADMINISTRATION

NEA ENGINEERING BULLETIN DX2212 **December 1992**

SUBJECT: NEA SPECIFICATION FOR CONCRETE POLES

* *

1. GENERAL:

Poles furnished to NEA specifications shall conform in all respects to the performance requirements of this standard. The text, figures and references to other standards supplement each other and shall be considered part of this standard. Poles are to be of the embedded type and not require special foundation.

2. MATERIAL:

a. The poles may be of pre-stressed concrete that will provide a minimum of 30 years of usable life in service here in the Philippines.

b. The following specification, standard and codes apply:

(a) American Concrete Institute (ACI) - 318 -- Building Code Requirements for Reinforced Concrete

(b) American Welding Society (AWS) - D12.1 -- Recommended Procedures for Welding, Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

(c) National Electrical Safety Code (NESC) -- Guideline for loading requirements and grade of construction

(d) Prestressed Concrete Institute MNL - 116 -- Manual for Quality Control for Plants and Production of Processor Prestressed Concrete Products

3. FINISH:

Finishes to the concrete surfaces shall be as follows:

A. Finish to static and centrifugal castings shall have a smooth finish with no cracks. Immediately after the screening has been completed, the excess mortar and water is removed. The top surface of the product shall be troweled smooth and the edges shall be tooled. The top surface of each product shall be

troweled until all projections, depressions and irregularities have been removed and the entire surface has a smooth texture with neat lines. Square corners and sharp edges shall be tooled to form smooth, chamfered corners. The Vendor's identification plate shall be attached to the product prior to the concrete curing.

After the product is removed from the form, all small cavities caused by air bubbles, honeycomb spots or other small voids shall be cleaned, saturated with water and then carefully pointed with mortar. A small cavity is defined as not exceeding 2" long and shall be repaired by opening the cavity sides on a 1 to 1 slope with a mechanical grinder, cleaning thoroughly and patching with an epoxy-aggregate mixture that will blend with the concrete. Apply mixture in accordance with manufacturer's specifications.

Products with cavities larger than 2" long shall be rejected.

B. Sealing Steel Strands - The end of each of the steel reinforcing strands in the top and butt shall be burned back and sealed with an epoxy protective coating.

4. **DIMENSIONS:**

a. The poles have been specified in accordance with the ANSI convention for classification of wood poles that is by length and strength class. The first number is the overall length in feet and the second number is the designation of the strength class. A 35-ft pole with a strength classification of 5 would be abbreviated as 35-5. The size of the pole at the ground line should be similar or larger than for that class of a wood pole, to assure that the earth surrounding the pole will provide the necessary resistance to develop the strength of the pole. The ground line circumference is shown on Table 1 on the following page.

b. Dimensional tolerance form that shown on the drawing shall be as follows:

Length +3" - 0"

Width and depth or diameter $\pm$ 1/16"
Brand or Mark $\pm$ 2"

Camber $\pm$ 1/8" for each ten (10) feet of length
Gain $\pm$ 1/4"

Bolt hole or insert spacing $\pm$ 1/8"
Bolt hole location from top of pole $\pm$ 1/8"

5. STRENGTH:

For the purposes of this specification, the strength of the pole is specified as a force acting at 90 degrees to the center line of the pole at a point two feet from the top of the pole. The amount of force in pounds that each classification must be able to withstand without damage is shown on Table 1.

6. FRAMING (HOLES):

With wood poles necessary holes for guying, transformers, etc. can be easily added in the field. It is not as easy to add holes when using concrete poles, nor does the normal climbing tools suffice. Included as Figures 1 through 3 are hole guides detailing the required holes and the gain for 25, 30, 35, 40 and 45 foot concrete poles. The holes are to be preformed by using inserts during casting of the pole.

Embedded items - Sleeves, sockets, inserts or other embedded items shall be accurately set in the molds and secured to prevent movement during concrete placing and spinning process. Particular care shall be used to insure proper cover on all embedded items.

TABLE 1 POLE STRENGTH AND GROUND LINE DIMENSION	
POLE LENGTH-CLASS[1]	STRENGTH REQUIREMENT[2]
25/2	3700
25/3	3000
25/4	2400
25/5	1900
25/6	1500
30/2	3700
30/3	3000
30/4	2400
30/5	1900
30/6	1500
35/2	3700
35/3	3000
35/4	2400
35/5	1900
40/2	3700
40/3	3000
40/4	2400
45/2	3700
45/3	3000
45/4	2400

[1] Poles length in feet and strength classification.

[2] Pole strength designated as a force in pounds acting at right angles to the centerline of the pole at a point two feet below the top of the pole and is applicable to both axes of the pole cross section.

7. MARKING:

a. Each concrete pole shall be identified with a Vendor's Identification Plate approximately 4" x 4" x 1/4" with the following stamped into the plate with letters not less than 1/2" high and the bottom of the plate shall be placed squarely on the face of the pole and at 10' from the butt of poles.

- o Vendor's name
- o Month and year of manufacturer
- o Length of pole
- o Class of pole
- o Pole number

b. The Vendor's Identification Plate shall be fabricated from a non-corrosive, non-staining metal such as Bronze, Brass or 6061T6 Aluminum. The plate shall have suitable anchor or anchors welded to the back of the plate to permit bond to the pole.

8. HANDLING:

The poles must have sufficient strength and ability to withstand inertial loading so that it will not be damaged under the following conditions:

a. with the pole horizontal, picking it up with a single point lift and

b. transport on a small trailer, without a special cradle and using one of the poles for towing the trailer for long distances on any of the Philippine roads and

c. unloading a pole by sliding the pole endways off of a truck bed, allowing it to tip down and then drop to the ground or shoulder of the road bed and

d. unloading a pole by rolling it off the side of a truck bed, down a ramp, with one foot of rise in two foot of run, onto the Coop's pole storage, which may be the ground.

9. INSPECTION AND TESTING:

The manufacturer shall conduct factory tests to verify that the poles comply with the requirements of this standard. NEA reserves the right to witness ANY OR ALL factory tests and the Supplier shall notify NEA 15 days before each

test is to be conducted. The Supplier is to furnish NEA a copy of all test reports. NEA expects to commission an internationally recognized third party, independent inspection and/or testing agency for independent inspection and/or testing at the factory, prior to shipping or after receipt of the poles in the Philippines. Any pole that fails an inspection is automatically rejected. It may be resubmitted for inspection, if the reason it failed inspection is of a correctable nature and it has been corrected. Any pole that fails a test is automatically rejected and additional poles from that lot must be tested in accordance with the testing schedule shown on Schedule 1. Appendix "A" Test Procedure for Pre-Stressed Concrete Pole and Appendix "B" Guidelines for Rejection/Acceptance of Pre-stressed Concrete Pole.

10. GENERAL INFORMATION:

The bidder is to supply with the proposal:

a. General dimension and weight of the poles by length and class.

b. The total groundline ultimate moment and the ultimate moment capacity needed and furnished at each ten (10) feet section of the pole or at a point where reinforcing steel continuity is changed.

c. Maximum deflection at top of structure for loading cases as specified in the Engineer's Loading Diagrams.

11. REPORTS:

The pole supplier shall furnish the Engineer with the following certified reports:

a. Pole Strength Test Report - Complete report on pole strength test, certified by independent testing laboratory, showing that proposed pole design complies with strength requirements, complete design computations showing section properties, stresses and expected resisting moments.

b. Concrete Test Reports - Five representative cylinders of each day pour shall be taken and tested in conformance with ASTM C31 and ASTM C29.

Testing of cylinders shall be done as follows:

One at release of pre-stressing force

One at three days

One at seven days

One at twenty-eight days

One spare

c. Steel Mill Reports - Certified mill reports of pre-stressing strands.

12. OTHER STANDARDS:

The dimensional and performance requirements of poles, 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 document.

SCHEDULE 1
TESTING SCHEDULE

One pole out of every lot of 25 poles shall be tested to 50 percent of its rated strength and a record kept of the deflection after a 2 minute hold at each multiple of 10 percent. This is a non-destructive test unless it shows some weakness indicating the pole could not meet the strength requirements and then it is to be carried to destruction.

One pole out of every lot of 100 poles shall be tested to destruction. If it fails at less than rated strength, then four additional poles from the same lot shall be tested to rated load. If they all pass, the lot is considered to have passed that test. If two or more of them fail, the entire lot is rejected. If only one of them fails, ten more from the same lot may be tested to rated load. If there are no failures, the remaining poles of that lot are considered to have passed that test, however, if there are any failures in these ten, the lot is automatically rejected.

APPENDIX "A"

TEST PROCEDURE FOR TRANSVERSE STRENGTH OF PRE-STRESSED CONCRETE POLE

1.0 SCOPE:

1.1 This test procedure applies to all sizes of pre-stressed concrete poles.

2.0 OBJECTIVES:

2.1 Primarily for guidance of inspection engineer and test engineer in witness/testing pre-stressed concrete poles at source, this procedure shall also be the standard procedure for test to be conducted by NEA.

3.0 EQUIPMENT:

3.1 Horizontal Butt Support Clamp Jig - to stimulate the pole foundation for testing in the horizontal position. The clap to be rigidly anchored at the test area.

3.2 Movable trolleys.

3.3 Wire, Rope, spliced and rigged.

3.4 Shackles

3.5 0-2500 kg (0-5600 lbs.) range or any suitable range dynamometer.

3.6 3-meter measuring steel tape.

3.7 Chalk or soapstone.

3.8 Rubber pads or wood splinters.

3.9 Plumb bob.

4.0 SPECIMEN PREPARATION:

4.1 Sampling Method

4.1.1 For every batch of 25 poles, one (1) pole shall be subjected to proof load test.

4.1.2 For every batch of 100 poles, one (1) pole shall be subjected to breakload test.

4.2 Select randomly from the pole class lot one (1) pole sample to be tested. The pole age should not be less than 28 days.

4.3 Inspect the sample for cracks. The sample should have no hairline cracks.

4.4 Note also the sample's curvature and preferably it should be acceptably straight.

4.5 Secure the sample on the horizontal butt support clamp, setting it at the ground line mark. Should the pole butt be loose on the clamp, use rubber pads or wood splinters as fillers.

4.6 Provide movable trolleys at the over-hanging portion to support and limit the sag.

4.7 For observation of crack development and determination of its point of occurrence, mark the pole longitudinally at intervals of 0.1 m with chalk or soapstone starting at the groundline.

4.8 Rig and secure a wire rope sling at 0.6 m from the pole tip with the dynamometer and the winch (this is the point of load application).

4.9 Attach a plumb bob at the load application point hanging the line approximately at the pole center line. This will serve as the indicator for measuring deflection.

5.0 SAFETY:

5.1 The pole shall be tested for bending. Participants in the test should stay away from the loading point opposite the rope pulling direction to avoid accident in case the rope breaks.

5.2 Do not stand on the pole when test load is being applied.

6.0 PROCEDURE:

6.1 Proof Load Test

6.1.1 Initially set the dynamometer to a load of 40% of the minimum breaking load. Apply load steadily until it reaches 40%. Hold for two (2) minutes. Note for the development of hairline crack. If crack appear at

the 40% load, the pole is considered to have FAILED the test. The batch represented shall be rejected.

6.2 Break Load Test

6.2.1 Initially set the dynamometer to a load of 40% of the minimum breaking load. Apply load steadily until it reaches 40%. Hold for one (1) minute. Note for the development of hairline cracks. If cracks appear at 40% load, the pole is considered to have failed the test. The batch represented shall be rejected.

6.2.2 If no cracks appear after the application of 40% load, set the dynamometer to a load of 50% of the minimum breaking load. Apply load steadily until it reaches 50%. Hold for one (1) minute. Note for the development of hairline cracks. Release load to zero; observe if the hairline cracks closed. If the hairline cracks did not close, the pole is considered to have failed the test.

6.2.3 Upon removal of the load, immediately increase the load gradually to 70% of the minimum breaking load and hold for two (2) minutes. Note for the development of additional hairline cracks.

6.2.4 Again remove the load and successively increase the load by an amount equal to 10% of the minimum breaking load up to 80% and thereafter increase by 5% of the minimum breaking load until failure occur, hold each load for two (2) minutes.

6.2.5 Measure load at the point of failure to the nearest 5 kilograms.

6.2.6 The pole is considered to have failed the break load test if it yielded at less than the minimum breaking load.

7.0 REPORT:

7.1 For test conducted at source, the test shall be prepared by the manufacturer in coordination with the witnessing inspection engineer or test engineer.

7.2 The following test data shall be collected and recorded in accordance with the attached format.

7.2.1 Manufacturer's serial numbers of test sample and the batch represented.

7.2.2 Pole Class

7.2.3 Date caste

7.2.4 Date tested

7.2.5 Age

7.2.6 Pole dimensions

7.2.7 Load, including point of failure

7.2.8 Deflection

7.2.9 Recovery

APPENDIX "B"

GUIDELINES FOR REJECTION/ACCEPTANCE OF PRESTRESSED CONCRETE POLE

A. Concrete Poles with Defects Subject to Rejection

Type of Defects	Extent of Damage/Defect
1. Excessive body cracks	Visible cracks which penetrate through the pole shell thickness. a) Tip location on crack extending up to the first bolt hole. b) It is not a hairline crack.
2. Clogged hollow portion	The hollow portion is not clear through
3. Honey combs or air bubbles	a) Air bubble or honey comb penetrate more than 1" of the pole shell and is located between the ground line and a point two (2) feet below the tip of the pole. b) Excessive honey combs or air bubbles no matter how deep they are.
4. Excessively curved	Deflection of any portion from center line is more than 1/1,000 of the over-all length of the pole.
5. Exposed wires	Wire is visible through holes or at the hollow portion of the pole.
6. Insufficient covering	Concrete cover less than the required 18 mm.
7. Thin section	The shell of the pole is less than required in the approved manufacturer's drawings.

B. Concrete Poles with Minor Defects

Type of Defects	Description	Remedial Measures
1. Open seams	Joint formed are with depressions.	Proper patching or grouting
2. Damage on bolthole	Minor damage on edge of holes due to premature or improper removal of bolthole insert.	Proper patching
3. Boltholes not through and through	Inadequate extension of hole insert.	Drill to obtain the required hole.
4. Boltholes are not aligned	Slight mis-alignment of boltholes due to unnecessary movement of bolt insert.	Repair of mis-aligned holes.
5. Damage on pole cap	Undesirable crack or chips on pole cap.	Replacement of pole cap.
6. Circumferentialchips or hairline crack at tip	Chips or hairline cracks not extending up to boltholes.	Remove chips and place concrete grout. Patch hairline crack.

C. Others

1. All required markings shall be completed.
2. All poles shall be properly aged.
3. Serial numbers shall be assigned only once.
4. Serial number of rejected poles shall not be re-used.
5. Surface serial number shall be the same as butt serial number.
6. All poles shall be provided with fish wire.
7. Supplier shall show to NEA Inspector the poles to be repaired before actual repairs are made.

PROOF LOAD / BREAK LOAD TEST

I. TEST POLE DATA:

Length/Class	_____	Pole Setting	_____
Serial No.	_____	P S Wire No./Dia.	_____
Date Castes/Age	_____	Rebars/Spirals	_____
Tip O.D./I.D.	_____	Ave Tip Shell Thick	_____
Butt O.D./I.D.	_____	Ave Butt Shell Thick	_____

II. BATCH REPRESENTED:

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

III. TEST RESULTS:

% REMARKS	LOAD, KG	TIME HELD, MINUTES	DEFLECTION W/LOAD, mm	DEFLECTION W/O LOAD, mm	REMARKS
40					
50					
60					
70		2			
10		2			
20		2			
30		2			
40		2			
50		2			
60		2			
70		2			
80		2			
85		2			
90		2			
95		2			
100		2			
BREAK		-			

IV. REMARKS:

_____

_____

_____

_____

V. WITNESSES:

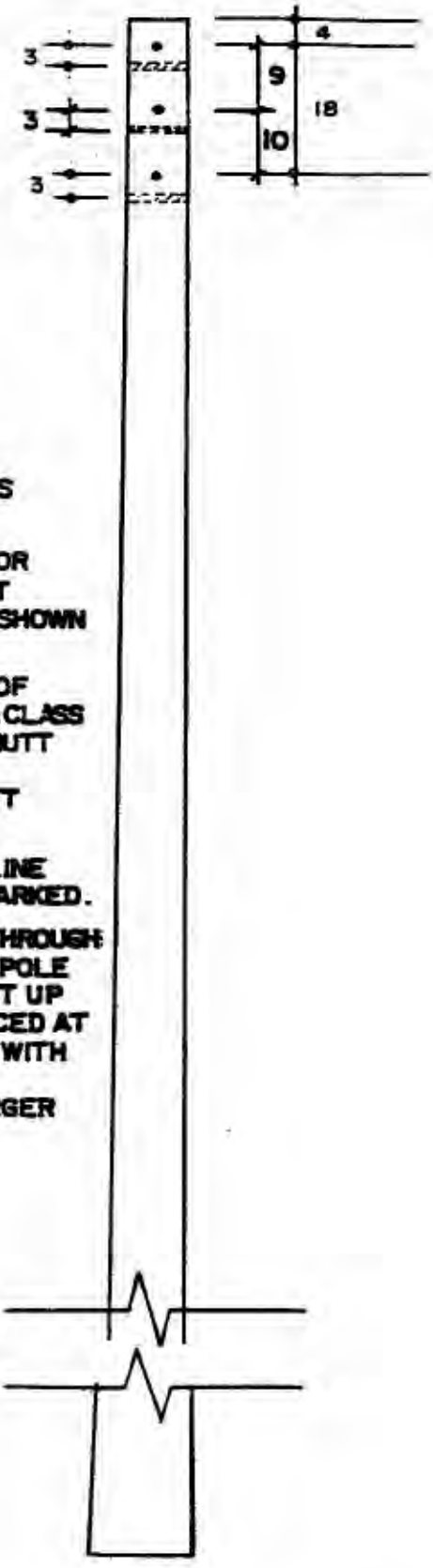
_____ _____

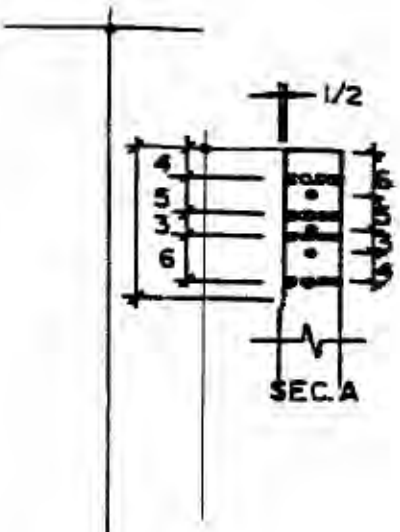
_____ _____

_____ _____

DATE OF TEST _____

PLACE OF TEST _____





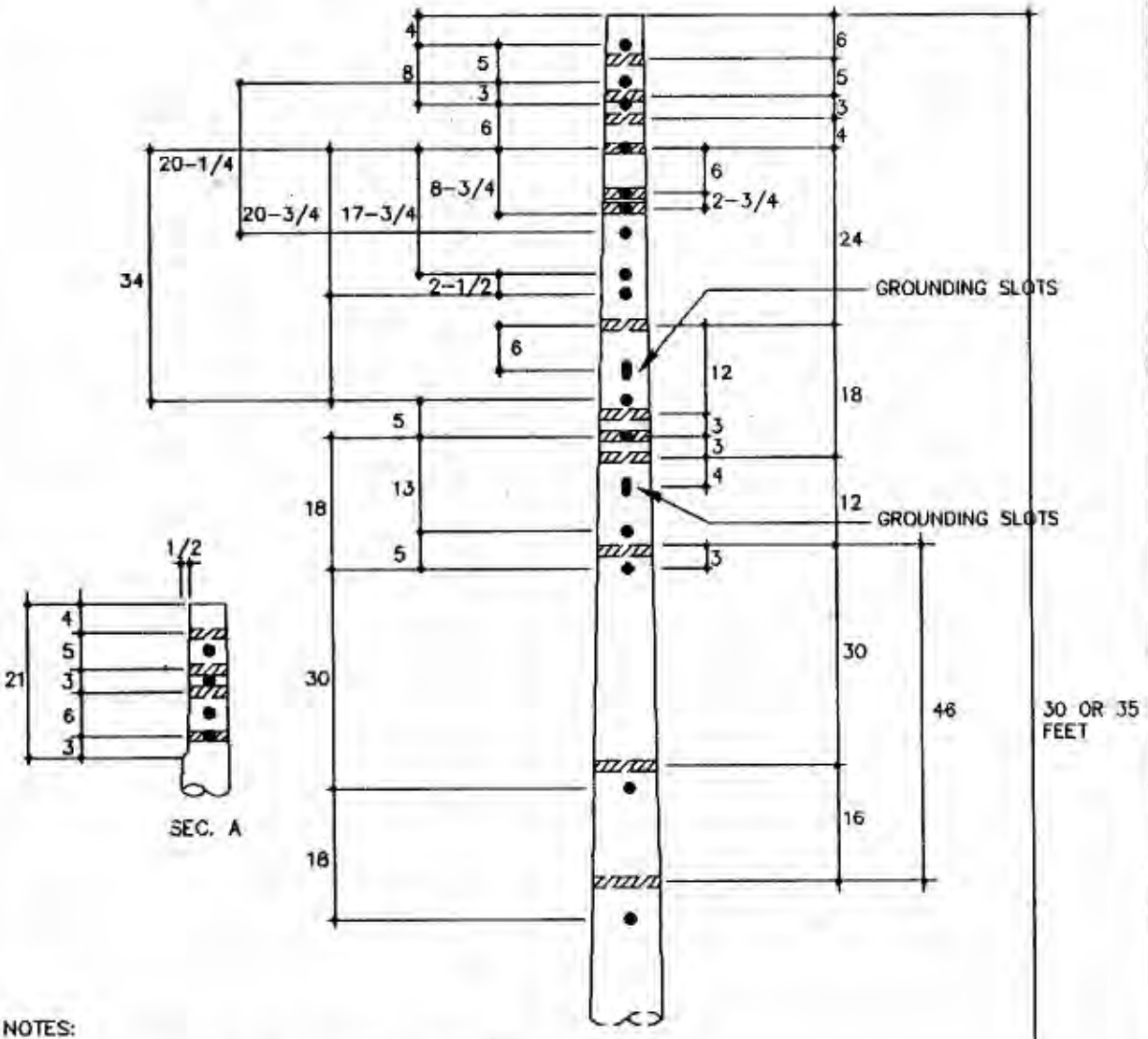
NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS SPECIFIED.
2. HOLES ARE THROUGH HOLES FOR 5/8" Ø BOLTS MOUNTING EXCEPT FOR GROUNDING SLOT WHICH IS SHOWN AS DETAILED.
3. MANUFACTURER'S MARK, DATE OF MANUFACTURE, POLE HEIGHT & CLASS SHALL BE INDICATED AT THE BUTT AND AT THE FACE OF THE POLE. 10 FT. FROM THE BUTT WITH RED ACRYLIC PAINT.
4. LIFTING POINTS AND GROUND LINE SECTION SHALL BE PROPERLY MARKED.
5. 5/8" Ø STEP BOLT HOLES ARE THROUGH & THROUGH TO THE BODY OF THE POLE STARTING 10 FT. FROM THE BUTT UP TO 4 1/2 FT. FROM THE TIP SPACED AT 20" ON CENTER. AT 90° ANGLE WITH THE FACE OF THE POLE.
6. BOLT HOLES TO BE 1/16" LARGER THAN BOLT SIZE.

SCALE 1:100M

DX2212.16

FIGURE 1
Bolt Hole Guide - 25 Foot Pole



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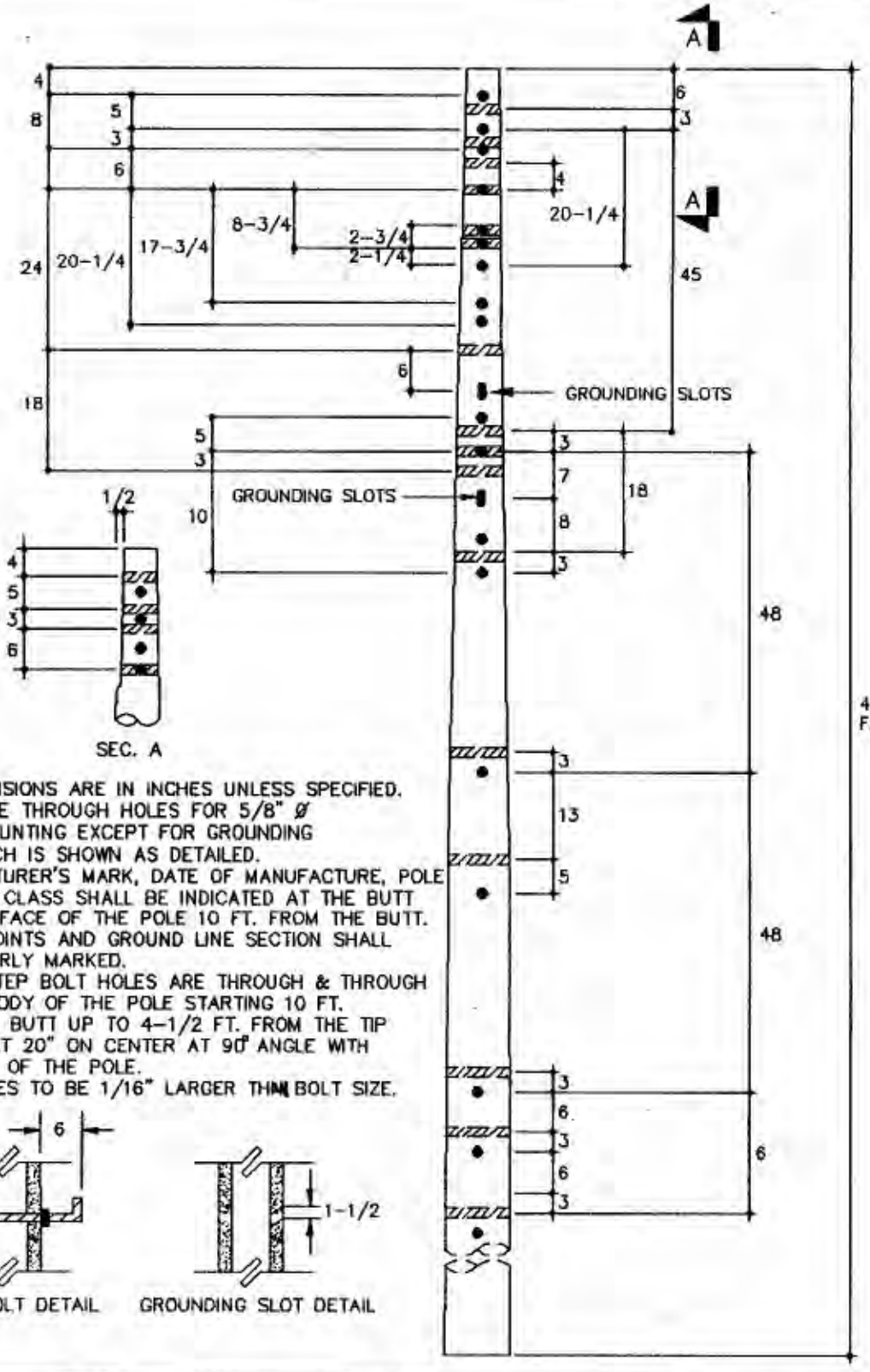
6. BOLT HOLES TO BE 1/16" LARGER THAN BOLT SIZE.

REPUBLIC OF THE PHILIPPINES
NATIONAL ELECTRIFICATION ADMINISTRATION

NON WOOD POLE FRAMING GUIDE 30 OR 35 FOOT POLES

JULY 1993		M20-1



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4. LIFTING POINTS AND GROUND LINE SECTION SHALL BE PROPERLY MARKED.
5. 5/8" Ø STEP BOLT HOLES ARE THROUGH & THROUGH TO THE BODY OF THE POLE STARTING 10 FT. FROM THE BUTT UP TO 4-1/2 FT. FROM THE TIP SPACED AT 20" ON CENTER AT 90° ANGLE WITH THE FACE OF THE POLE.
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STEP BOLT DETAIL GROUNDING SLOT DETAIL

REPUBLIC OF THE PHILIPPINES
NATIONAL ELECTRIFICATION ADMINISTRATION

NON WOOD POLE FRAMING GUIDE 40 OR 45 FOOT POLES

JULY 1993		M20-2

NATIONAL ELECTRIFICATION ADMINISTRATION

NEA ENGINEERING BULLETIN DX2213 DECEMBER 1992

SUBJECT: NEA SPECIFICATION FOR STEEL POLES

* *

1. SCOPE:

This specification establishes the physical characteristics and performance requirements of steel poles for use on the cooperatives electric system.

2. GENERAL:

Poles furnished to NEA specifications shall conform in all respects to the performance of this standard. The text, figures and references of other standards supplement each other and shall be considered part of this standard. The poles are to be of the embedded type and not to require a special foundation.

3. MATERIAL:

Steel poles shall be fabricated from structural quality hot rolled steel which conforms to ASTM A570-79, "Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality."

4. WELDING, DRILLING AND PUNCHING:

All welding, drilling and punching shall be completed prior to applying the galvanizing. Care shall be taken to clean all filings and weld splatters from the pole surface prior to finishing. The weld shall have 60 percent fusion in welds between plates having a thickness of 3/8 inch or less and 80 percent where plate thickness is greater than 3/8 inch. No cracking, undercutting of weld metal or weld blow holes shall be permitted.

5. FINISHING:

The pole shall be cleaned of scale, rust, oil, paint and other surface contaminants and then rinsed in an alkaline cleaning bath. The steel shall then be bathed in a diluted acid (sulfuric or hydrochloric) bath for at least five minutes. Just prior to galvanizing, the acid cleaned steel shall be immersed in a flux solution of 30% zinc ammonium chloride with wetting agents and maintained at 65 deg. C until galvanizing is completed. Steel poles shall be hot dip galvanized in accordance with ANSI/ASTM A153-82, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware. This standard

requires a minimum zinc coating of 610 grams / sq. m. The coating shall be continuous,smooth, reasonably uniform in thickness and free of blemishes and other imperfections which are inconsistent with commercial practice. Galvanized articles shall be free from coated areas, blisters, flux deposits, acid and black spots, and dross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted. All holes shall be clean and reasonably free from excess zinc.

6. FASTENERS:

All fasteners, such as thread inserts, shall be of non-corrosive and/or non-rusting material compatible with the steel and its coating. All holes shall be filled with plastic or other suitable insert to reduce wind noise from whistling pole holes and to reduce potential damage to the holes.

7. POLE SECTIONS:

If the pole is to be provided in two sections, it shall have at least two (2) foot slip joint and shall be keyed so the pole only can be field assembled as intended by the manufacturer.

8. DIMENSIONS:

A. The poles are specified in accordance with the ANSI Standard for classification of wood poles, that is by length and strength class. The first number is the overall length in feet and the second number is the designation of the strength class. A 35 foot pole with a strength classification of 5 is abbreviated 35/5. The diameter of the pole at ground line shall be similar to an equivalent wood pole of that height and class to assure that the earth surrounding the pole will provide the necessary resistance to develop the strength of the pole.

B. Dimensional tolerance from that shown on the attached Table 1 shall be as follows:

Length	+ 3.0",- 0.0"
Diameter at Ground line	+/- 0.25"
Brand Marking	+/- 2.0"
bolt hole or Insert Spacing	+/- 0.125"
bolt hole location from top of pole	+/- 0.125"

9. STRENGTH:

The strength of the pole is specified as a force acting at 90 degrees to the center line of the pole at a point two feet from the top of the pole. The amount of force in pounds that

TABLE 1 POLE STRENGTH AND GROUND LINE DIMENSION	
POLE LENGTH-CLASS[1]	STRENGTH REQUIREMENT[2]
25/2	3700
25/3	3000
25/4	2400
25/5	1900
25/6	1500
30/2	3700
30/3	3000
30/4	2400
30/5	1900
30/6	1500
35/2	3700
35/3	3000
35/4	2400
35/5	1900
40/2	3700
40/3	3000
40/4	2400
45/2	3700
45/3	3000
45/4	2400

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1 Pole length in feet and strength classification.

2 Pole strength designated as a force in pounds acting at right angles to the centerline of the pole at a point two feet below the top of the pole, and is applicable to both axes of the pole cross section.

each classification must be able to withstand without damage is shown on Table 1.

10. FRAMING:

To assure adequate attachment points for crossarms, guys, neutral and pole top brackets and crossarm braces, each pole shall have proper fittings to make these attachments. Also proper fittings shall be provided for detachable pole climbing steps or stairs to facilitate stock filing of pole. Figures 1 through 3 provide an attachment guide detailing the required location for each hole for 25, 30, 35, 40 and 45 foot steel poles. The attachment points are to be provided with either a through hole or a "rivnut", a hollow rivet type fastener with internal threads for mounting equipment onto the pole. An alternative fastening method is with a steel banding system and this method will be used in the field for special equipment mounting requirements. All holes and or rivnut attachment points shall be included as part of the pole unit. The rivnuts and their installation tool may be supplied for installation in the field provided they are properly labeled for location, size and strength and properly packaged. The purpose of this requirement is to reduce the material stocking requirements of the purchaser and to keep the construction methods compatible with the existing materials and equipment.

11. MARKINGS:

Each steel pole shall be identified by the vendor by stamping into the pole, prior to coating, with letters not less than 1/2" high squarely on the face of the pole at ten (10) feet from the butt of the pole. The following information shall be stamped into the pole:

- o Vendor's name
- o Month and year of manufacture
- o Length of pole
- o Class of pole
- o Type of coating
- o Pole production or serial number

The marks shall be legible after application of the protective coating.

12. HANDLING:

The poles must have sufficient strength, durability and ability to withstand inertial loading so that it will not be damaged under the following conditions:

a. with the pole horizontal, picking it up with a single point lift and
b. transport on a small trailer, without a special cradle and using one of the poles for towing the trailer for long distances on any of the Philippine roads and
c. unloading a pole by sliding the pole endways off of a truck bed, allowing it to tip down and then drop to the ground or shoulder of the road bed and
d. unloading a pole by rolling it off the side of a truck bed, down a ramp, with one

foot of rise in two foot of run, onto the pole storage, which may be ground or hard surface.

13. INSPECTION AND TESTING:

The manufacturer shall conduct factory tests to verify that the poles comply with the requirements of this standard. NEA reserves the right to witness ANY OR ALL factory tests and the Supplier shall notify NEA fifteen (15) days before each test is to be conducted. The Supplier is required to furnish NEA a copy of all test reports. NEA expects to commission an internationally recognized third party, independent inspection and/or testing agency for independent inspection and/or testing at the factory, prior to shipping or after receipt of the poles in the Philippines. The galvanizing shall be tested in accordance with ASTM Standard A 123-89. Any pole that fails an inspection is automatically rejected and additional poles from that lot must be tested in accordance with the following testing schedule:

TESTING SCHEDULE

One pole out of every lot of 25 poles shall be tested to 50 percent of its rated strength and a record kept of the deflection after a two (2) minute hold at each multiple of 10 percent. This is a non-destructive test unless it shows some weakness indicating the pole could not meet the strength requirements and then it is to be carried to destruction.

One pole out of every lot of 100 poles shall be tested to destruction. If it fails at less than rated strength, then four additional poles from the same lot shall be tested to rated load. If they all pass, the lot is considered to have passed that test. If two or more of the additional test poles fail, the entire lot will be rejected. If only one of them fails, ten more from the same lot my be tested to rated load. If there are no failures, the remaining poles of that lot are considered to have passed that test, however, if there are any failures in these ten, then the lot is automatically rejected.

PROCEDURE

Proof Load Test:

Initially set the dynamometer to a load of 40% of the minimum breaking load. Apply load steadily until it reaches 40%. Hold for two (2) minutes. Note for the development of weld cracks or splitting. If any appear at the 40 % load, the pole is considered to have FAILED the test and the batch represented shall be rejected.

Break Load Test:

Initially set the dynamometer to a load of 40% of the minimum breaking load. Apply load steadily until it reaches 40%. Hold for one (1) minute. Note for the development

of weld splits or cracks. If cracks appear at 40% load, the pole is considered to have failed the test. The batch represented shall be rejected.

If no cracks or splits appear after the application of 40% load, set the dynamometer to a load of 50% of the minimum breaking load. Apply load steadily until it reaches 50%. Hold for one (1) minute. Note for the development of cracks or splits. If found the pole is considered to have failed the test. Release load to zero.

Upon removal of the load, immediately increase the load gradually to 70% of the minimum breaking load and hold for two (2) minutes. Note for the development of additional cracks or splits.

Again remove the load and sussessively increase the load by an amount equal to 10% of the minimum breaking load up to 80% and thereafter increase by 5% of the minimum breaking load until failure occur, hold each load for two (2) minutes.

Measure load at the point of failure to the nearest 5 kilograms.

The pole is considered to have failed the break load test if it yielded at less than the minimum breaking load.

14. REPORT

For tests conducted at source, the test shall be prepared by the manufacturer in coordination with the witnessing inspection engineer or test engineer.

The following test data shall be collected and recorded in accordance with the attached format:

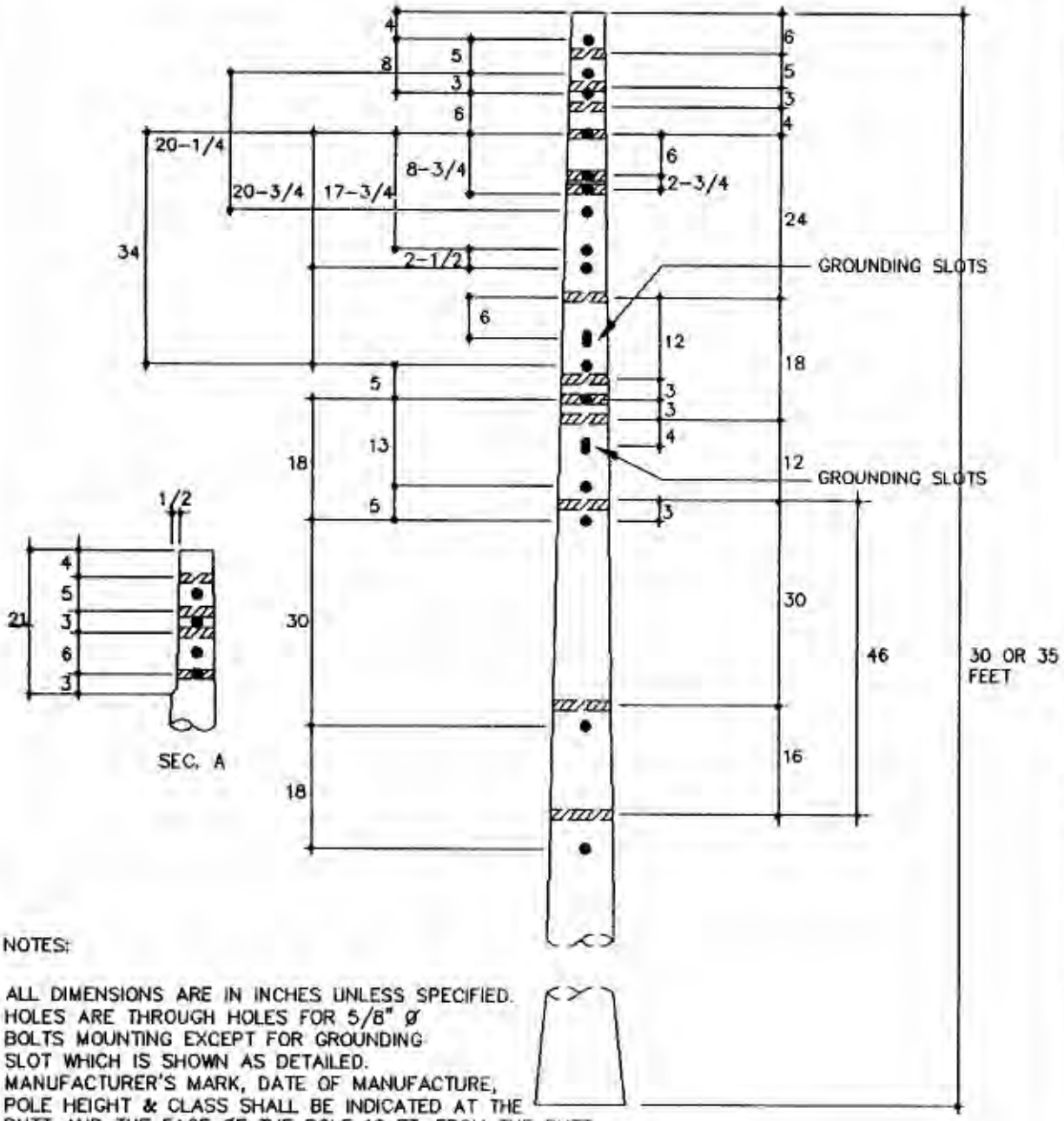
Manufacturer's serial numbers of the test pole sample.
Pole Class
Date Manufactured
Date Tested
Pole dimensions
Load, including point of failure
Deflection
Recovery

Galvanizing thickness measured at ground line, pole butt and pole top

15. HARDWARE INCLUDED WITH POLES

Ladder Clips

Pole Gains
Rivnuts
Pole roof
Pole Butt Cover
Ground line Pole Protection
Ladder Clip Bolts for Rivnuts
Galvanizing Patching Material, either Zinc rich paints or metallizing material



NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS SPECIFIED.
2. HOLES ARE THROUGH HOLES FOR 5/8" ø BOLTS MOUNTING EXCEPT FOR GROUNDING SLOT WHICH IS SHOWN AS DETAILED.
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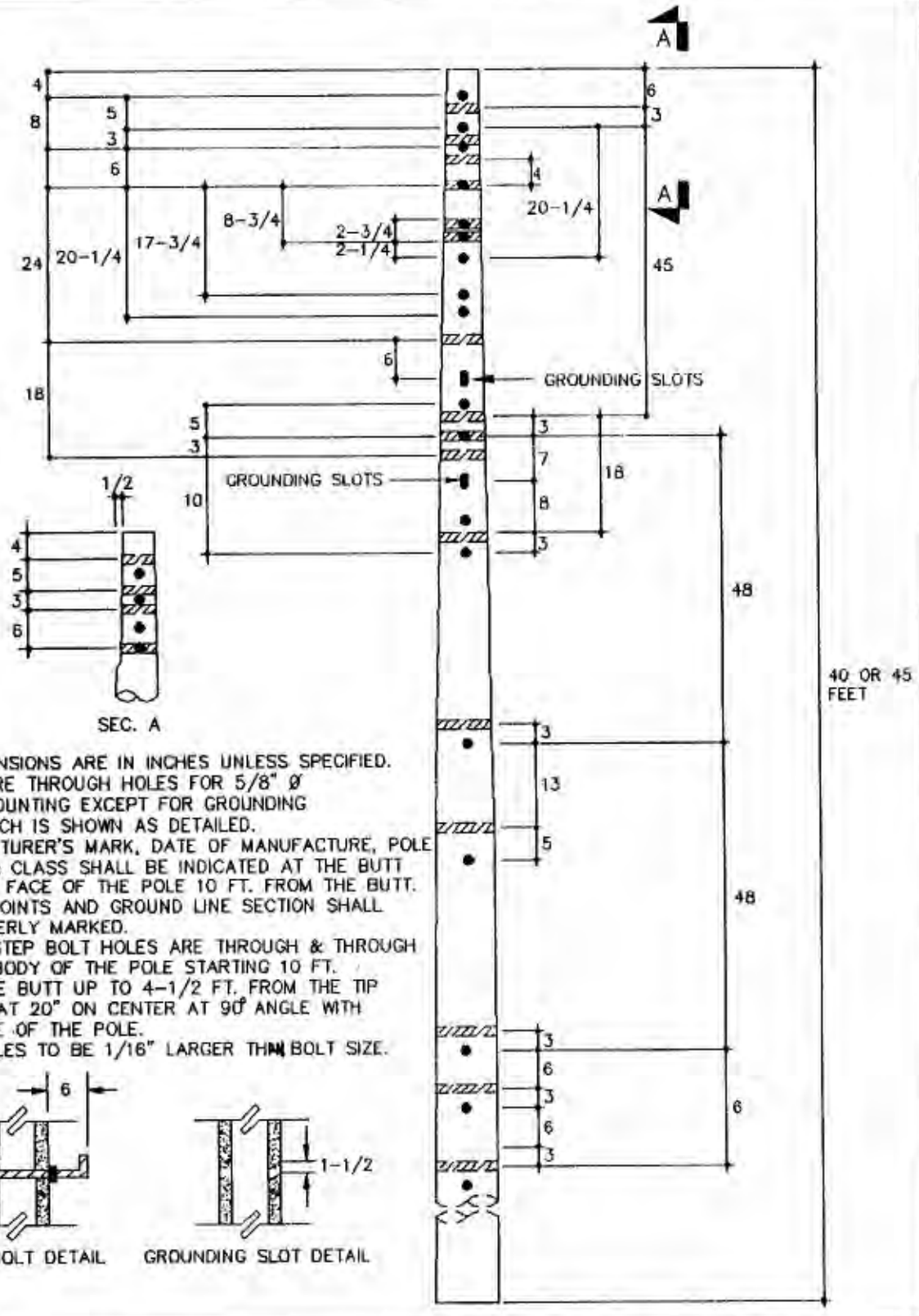
NON WOOD POLE FRAMING GUIDE 30 OR 35 FOOT POLES

JULY 1993		M20-1



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