M13-13 AMERICAN WOOD PROTECTION ASSOCIATION STANDARD

GUIDELINES FOR A POLE MAINTENANCE PROGRAM

Jurisdiction: AWPA Technical Committee T-4

This Standard was initially adopted in 1972 and renamed in 2007. Revised in 1992, 1993, 1995, 1999, 2001, 2007, and 2013. Reaffirmed in 2000, 2006, and 2013.

This AWPA Standard is promulgated according to an open, consensus procedure.

1. Scope: The purpose of this document is to help utilities and other pole owners understand how to develop, implement and manage a wood pole maintenance program. An overall pole asset management plan can prolong asset life, reduce failures or outages, improve reliability, limit potential claims or liability and allow for more efficient deployment of line crews thereby optimizing overall system costs. This document discusses the various components of an effective pole maintenance program including personnel requirements, inspection methods, remedial treatment products, and data management requirements for a wood pole maintenance program. The American Wood Protection Association believes the information contained herein to be based upon current scientific and in-field practices and applications for general information purposes. In supplying this information the Association makes no warranty or representation, either expressed or implied, as to the reliability or accuracy of provided information; nor does the association assume any liability resulting from the use of or reliance upon the information by any party. This document should also not be construed as a specific endorsement or warranty; direct or implied, of treated wood products, inspection methods, preservatives or structural enhancements in terms of performance, environmental impact, or safety. The information contained herein should not be construed as a recommendation to violate any federal, state, local or municipal law, rule or regulation. Any party using pressure treated wood products or remedial preservative systems or structural enhancements should review any applicable Federal/State/Local laws, rules or regulation prior to the use of any of these products.

2. Introduction: Wood poles have been used by the utility industry for over 100 years. Today over 150 million wood poles are in service in North America. The economics, resilience, ease of installation, and adaptability, as well as their strength to weight ratio are but a few of the reasons that wood poles continue in use today. The major cause of deterioration in wood poles is groundline decay. Due to a variety of environmental factors, preservative levels within the pole eventually decline below levels necessary to prevent fungal or insect attack. For this reason, remedial treatments were developed to supplement and maintain a level of protection in poles and thereby increase service life of the pole. As the costs of pole replacement increase, the ability to extend the service life of wood poles may be more important to pole owners. In addition, several state utility commissions have recently mandated pole maintenance programs. These trends have led many utilities to seek more information about pole maintenance.

3. Personnel: Properly trained personnel are critical to the success of a pole maintenance program. One of the pole owner's first decisions is whether to perform the service with in-house employees, utilize a contractor(s), or a combination of the two. Regardless of who performs the work it is important that quality control processes are in place to insure the work is performed as specified:

3.1 In-house employees: When using in-house employees the pole owner must identify and determine the skills, knowledge and experience of the individuals chosen to perform the steps of the program. Knowledge of wood, how a pole is used, and the nature of various types of pole degradation are essential. The employee should be familiar with the original treatments used on the poles in the system. They shall also be familiar with remedial treatment systems and the product labels and MSDS sheets for products used and will use the products according to EPA, DOT and OSHA requirements. This includes the use of appropriate Personal Protective Equipment (PPE) to assure worker safety. Proper transportation and storage of tools and remedial treatments are also critical for the safety of employees and the general public. While not always required by the EPA label, the application of all preservative systems by a certified applicator is required in most states for commercial applications. In any case, requiring applicators to be licensed assures employees receive a certain level of training and safety awareness. Employees should also be aware of, and have procedures for following the State and Local notification requirements. Proper supervision must be in place to monitor the accuracy and effectiveness of the fieldwork. The performance of the individual inspector will have a major impact on the success of the program.

3.2 Contractor(s). When an independent contractor is utilized the same requirements (mentioned in the above paragraph) must be in place for contractor employees as well. Some requirements such as having certified pesticide applicators may be a state requirement. The contractor should have sufficient liability insurance to protect the utility from exposure to damage claims, misuse of pesticides, etc. The contractor should be required to have a minimum level of experience. The contractor must have documented programs/policies conforming to EPA, OSHA, and DOT regulations. These policies must include Safety Manual, Pesticide Training Manual and test, standards for safe storage of preservatives on vehicles, operating policies for contractor's personnel to handle preservatives, procedures for disposing of empty remedial treatment containers, and compliance with OSHA regulations involving personal protective equipment. The Pole Owner supervisor of the

Contractor should also be familiar with State pesticide applicator licensing requirements.

Pole inspection personnel should:

a) Have a minimum of eight (8) weeks classroom and field training in the art of inspecting and treating poles.

b) Be able to pass a written or demonstration test to the satisfaction of the pole owner.

c) Have passed a pole owner approved pesticide training program, qualifying the pole inspector as being trained to handle wood preservatives. In most cases, contractors would be qualified due to State licensing requirements.

The owner reserves the right to ask for evidence of previous experience and training in the form of letters of reference and test results. A quality assurance plan should be enforced with joint responsibilities between the contractor and the Pole Owner determined prior to the start of work. Pre-bid meetings and bid/performance bonds are good ways to meet and qualify potential contractors. Both contractors and supervising utility personnel need to be aware of regulations and contractual requirements.

3.3 Joint program. A joint program will include the above requirements with definitive responsibilities assigned to the involved parties. For example, a Pole Owner may survey poles to identify those that need further investigation by a contractor, or the contractor may perform the inspection and treatment, and the Pole Owner may perform the follow up assessment of poles "rejected" by the contractor and identified for restoration.

4. Inspection Procedures: There are many variables that affect the accuracy of an in-place wood pole inspection. The most significant is the inspection method, or combination of inspection methods used to inspect a given pole. Different methods are not equally effective. It is the pole owners' responsibility to specify the method(s) that will be used. Following are descriptions of the various procedures that can be used when inspecting wood poles:

4.1 Visual above-ground inspection. A visual inspection of all poles should be made from groundline to the top of the pole. Any situations out of the norm involving the structural integrity of the pole or its attachments should be recorded as part of the evaluation. Examples of conditions to be noted are; woodpecker, lightning, fire and mechanical damage. The location severity and size of the damage should be recorded. Insulators, cross arms, guys, anchors, grounds, and tagging should be inspected as well. If the pole is not suited for continued service due to serious defects, it should either (1.) Not be tested further but simply be reported and marked on the inspection form as a visual reject or (2.) The pole may be sound and bored to determine its condition at groundline and marked on the inspection form as a sound and bore reject. This inspection method provides no indication of groundline strength except for the possible notation of pole class. If used alone, this inspection method provides little information to help the Pole Owner improve its pole plant. It will miss most priority and reject poles.

4.2 Partial excavation. Pole should be excavated in one or more quadrants in an area where the inspector feels decay is most likely to occur. Depth of the excavation can range from 6" to 24" depending upon local environmental conditions. This will be accomplished by removing a shovel full of earth from each side of the pole before each boring. A wire brush or check scraper is to be used to clean the below ground portion of pole to inspect for and locate exterior decay. Poles set in pavement, or which have concrete collars within six inches of the groundline, or those which can not be completely excavated for some other reason cannot be excavated and therefore should be bore tested as described below. This inspection method can be expected to identify many but not all inspected poles with decay below ground or other conditions causing a reduction in the required strength at groundline. Used in conjunction with visual inspection plus sound and bore, historical data shows that approximately 80-90 percent of reject and priority poles will be found.

4.3 Full excavation. All poles passing the above ground visual inspection and meeting the specific age, species or original treatment criteria should be excavated 360°around to a depth of 18" below groundline. In areas where deep decay is a concern, excavations can be extended to a depth of 20" to 24". The excavation will be approximately 10" from the pole at ground level and 4" from the pole at the 18" depth to allow for proper use of the various inspection tools in order to obtain an accurate inspection. For excavation in lawns, sod grass areas, or gardens, care will be taken to keep surrounding area as clean as possible. The sod around the pole should be carefully cut and neatly stacked. Poles installed on slopes should be excavated to a minimum depth of 18" on the down slope side and 18" on the high side. Tarpaulins or ground cloths should be used at all times to protect landscaping, temporarily store removed soil and facilitate backfilling. This inspection procedure constitutes the most thorough method known but is nevertheless not perfect because of the variables previously discussed and because obstructions such as rock, adjacent buildings, sidewalks, keys, roots, risers, deep decay, underground cables and other obstacles sometimes prevent "full" excavation and/or treatment with respect to depth, circumference or both. Used in conjunction with visual inspection, historical data shows approximately ninety-nine percent (99%) of reject and priority poles will be found.

4.4 Sounding. Poles should be sounded with a hammer on all sides of the pole from as high as the inspector can reach to the exposed groundline area in order to locate interior pockets of decay. Hammer marks should be visible to indicate where the pole was sounded.

4.5 Boring. Inspector should bore the pole with a 3/8" or ½" bit. The bored hole should be located at either (1.) groundline if the pole is not excavated or (2.) areas where the inspector expects to find decay. Excavated poles should be bored at least once below ground level. If multiple borings are taken care should be taken to insure they are not on the same plane. The hole should be drilled at a 45-degree angle to a depth of the centerline of the pole. Shell thickness indicator should be used to measure existing shell thickness and detect the extent of the interior decay. If heart rot or

enclosed decay pockets are evident in a pole, a minimum of three (3) borings will be taken to determine the size and extent of decay. An inspector is not able to determine the size of an internal void with less than 3 borings. Multiple borings should not be taken on the same plane. Bored holes should be plugged with tight-fitting treated wood or plastic plugs. This inspection method combined with sounding can miss poles without sufficient strength to meet NESC or other mandated overload capacity requirements, and there is the possibility of missing those poles with insufficient strength to support the current wire loading. This is particularly true when the decayed area is below ground level or if the inspector's tools do not contact hidden, damaged areas. Used in conjunction with visual inspection, historical data shows approximately 50 to 60 percent (50-60%) of reject and priority poles will be found.

4.6 Decay removal. Loose and decayed wood is to be removed from 18" below groundline to 6" above groundline. A chipping tool should be used for this procedure to obtain a smooth, clean removal of wood. External decay pockets will be shaved or chipped to remove decay from the pole. It is essential that exterior decay is removed from the hole and surrounding ground and disposed of properly. Care should be taken not to remove good wood, as this will reduce the strength of the pole. The pole should be scraped using a check scraper, or wire brush to remove dirt from the treatment zone.

5. Evaluation: Pole inspection can identify both internal and external decay as well as mechanical defects at or near the groundline. Adjustments should be made to account for the strength loss associated with any decay or mechanical defects identified by the inspector. There are several methods to accomplish this, some of which include: (1.) Make adjustments in circumference to account for external decay pockets and/or mechanical defects and internal decay in accordance with approved tables. The effective remaining circumference is then compared against approved loading tables. (2.) There are software programs available that can be used to determine strength reductions based on the inspectors input. The National Electric Safety Code (NESC) and General Order 95 (G.O. 95) state that wood structures will be replaced or rehabilitated when deterioration reduces the strength to 2/3 of that required when installed. It is the Pole Owners responsibility to specify the criteria for rejecting poles. A Pole Owner can evaluate poles based upon: (1.) Actual load vs. remaining strength of the structure or (2.) Original strength of the structure vs. remaining strength of the structure. Poles below minimum strength should be rejected, and so marked in the field and reported. Some Pole Owners also establish criteria for severely decayed or "priority poles" and require the inspector to report these poles to the Pole Owner on a daily basis.

6. Pole Marking and Records:

6.1 Tagging. All poles inspected should be tagged to indicate the type and year of inspection performed, as well as any remedial treatments applied.

6.2 Data collection. All information collected in the field should be recorded as accurately as possible, according to utility specifications. The preferred method of data collection is electronically as this allows for the creation of a searchable database. The pole inspection reports will provide the following information:

Following is an example of items that may be collected during an inspection program: It is the Pole Owners responsibility to determine and specify specific data requirements.

6.2.1 Heading.

Each report sheet should have the information listed below in the heading:

a) Utility Name
b) Division (where relevant)
c) Contractor Name
d) District (where relevant)
e) Foreman Name
f) Line/Map Number
g) Supervisor Name
h) Page Number
i) Date of Work

6.2.2 Report content.

6.2.2.1 The following pole information should be collected:

a) Pole Number
b) Type of Treatment
c) Manufacturer
d) Original G/L Circumference
e) Year Mfg
f) Effective G/L Circumference
g) Height
h) Species
i) Class

6.2.2.2 Column headings should be available to mark the appropriate item or items performed on each pole.

a) Treat – (Type)
b) Sound and Bore
c) Reject
d) Visual
e) Treated Reject
f) Partial Treat
g) Company that Performed
h) Fumigant – (Type/volume applied)
i) Initial Treatment
j) Internal Treat – (Type/volume applied)
k) Last Year Treated
l) Decay This Cycle

Remarks section should be capable of describing all decay conditions as well as maintenance items that should be noted.

7. Remedial Treatment Products: Remedial treatment systems are designed to extend utility pole service life by supplementing the original preservative treatment. These products are applied either to the surface or inside of the pole. Currently, the following four types of remedial treatment systems are available commercially: (1) external pastes or bandages, (2) internal fumigants, (3) Liquid/paste internal treatments and (4) diffusible rods. Each system has the same goal of controlling wood-destroying fungi and/or insects; however they differ greatly by function, formulation, application and zone of effectiveness. Each product must be handled and used in accordance with all instructions on its EPA label in regards to application zone, application rate and the use of the required PPE. The MSDS should be reviewed for additional product information. Prior to accepting any remedial treatment system, the Pole Owner should review laboratory and field test data intended to demonstrate efficacy against the target wood destroying organisms. However, it is acknowledged that field data obtained from in-service poles is the most valuable data for evaluating the long-term efficacy characteristics of a remedial preservative system. The field performance data should include chemical analysis results showing residual levels of active ingredients at various depths of penetration over time.

7.1 External pastes and bandages are designed for application to the groundline area of poles to control or prevent decay. Once applied, the active ingredients migrate into the pole and protect the outer shell. The zone of protection is determined by the ability of the active ingredients to penetrate at a level toxic to wood destroying organisms. Depending on pole species, oil-borne active ingredients typically migrate in effective levels up to a depth of ½"-¾" which is believed to be the depth of penetration of the oil solvent carrier. However, waterborne diffusible actives will penetrate up to 2"-3" deep in thick sapwood species. External pastes or bandages are often the primary remedial treatment for thick sapwood species such as southern pine. However, all oil-borne treated poles eventually lose resistance to decay, and the application of an external treatment provides an economical extension of their useful service life. External groundline treatment is recommended under the following conditions:

7.1.1 Whenever a pole is excavated during an inspection and the pole is sound or weakened by decay but not advanced to the point where the pole needs to be replaced.

7.1.2 When statistics show that a pole is susceptible to the onset of decay based upon age, species, original treatment, geographic location, manufacturer or any combination of the above.

7.1.3 Whenever a salvaged pole is reset for use. Prior to the application of external groundline preservatives, decayed wood should be removed from the pole and the excavated hole and disposed of properly. The preservative should be applied to the pole according to label directions. If the application rate is variable, the maximum rate should be applied to provide maximum efficacy unless test data indicates otherwise for the specific conditions. In the case of pastes, a polyethylene-backed, water impermeable paper should be wrapped around the pole after the preservative is applied, to contain the preservative to the zone of application. Bandages are generally manufactured with a durable outer layer and do not require an additional polyethylene-backed paper. Pastes are considered an effective treatment in cases where decay was removed prior to treatment because the brush on application can provide a thorough coverage to decay pockets and checks. Bandages that make contact with the roughened pole surface should be adequate as well.

7.2 Fumigants are designed to prevent and/or control internal fungal decay. Commercially available fumigants currently include both liquid and solid formulations. Once applied to the pole, fumigants volatize and move both radially and longitudinally throughout the pole, although preferential migration is in the longitudinal direction. The rate of volatilization and migration of the active ingredient varies with application, formulation, environmental, and pole conditions. The zone of protection is the section of the pole where the active ingredient migrates to at or above threshold level. Fumigants generally migrate several feet longitudinally from the point of application. They are often used as the primary remedial treatment for thin sapwood species such as Douglas fir and western red cedar. Fumigant treatment is recommended under the following conditions:

7.2.1 Whenever internal decay has been identified and the damage has not advanced to the point where the pole needs to be replaced.

7.2.2 When statistics show that a pole is susceptible to the onset of decay based upon age, species, original treatment, geographic location, manufacturer or any combination of the above.

7.2.3 In conjunction with external pastes or bandages on poles that have both internal and external decay.

7.2.4 When poles cannot be excavated due to the presence of obstructions, pavement, landscaping, or other barriers that make excavation difficult or unsafe. Fumigants must be applied to the poles according to label directions. These products are generally applied by boring a series of downward angled holes in a spiral pattern beginning at the ground-line or below and progressing upwards. The fumigant is then applied to the application holes and the holes plugged with a tight-fitting treated wood or plastic plug. The number of holes required is dependent upon the circumference of the pole and the amount of fumigant required. Application holes should not intersect internal voids or checks in order to minimize any loss of fumigant and fumigant vapor. Liquid formulations are more susceptible to fumigant loss through voids or checks. As a result, for maximum efficacy, fumigants should be applied to sound wood.

7.3 Liquid or paste internal treatments typically contain fungicides and/or insecticides and are used to treat voids or internal decay pockets that are caused by insects, decay or both. In order to insure surface contact with decay voids or insect galleries, internal treatments are typically applied using low pressure (< 25psi). It is important to drill a

sufficient number of holes to ensure surface contact of treatment within the decay void or insect galleries. Water diffusible active ingredients will migrate some distance from point of application dependent, in part, upon the amount of time the diffusibles are in surface contact. Some external groundline preservatives are also labeled for use as internal treatments. In the case of carpenter ant infestations it is important to use a treatment pattern and insecticide that will protect against re-infestations.

7.4 Solid Diffusible Rods contain water-soluble active ingredients that migrate with moisture present in the wood to control and/or prevent internal fungal decay. The zone of effective treatment is determined by the distance the active ingredients move from the point of application at fungitoxic levels. Studies have shown wood moisture contents in excess of the fiber saturation point (~30%) are necessary for significant migration to occur. Wood moisture levels typically found at groundline in the internal regions of in-service utility poles are generally sufficient to allow for adequate diffusion with an appropriate drill pattern in the treatment zone. Placement of treatment holes farther below groundline may be necessary in drier areas in order to intersect wetter areas of the wood. Active ingredients from rods will tend to move more slowly than fumigants. Migration may be enhanced by the addition of water and/or water-borne liquid preservative solutions. Diffusible rods should be applied according to the label directions. They are typically applied through a pattern of downward angled holes beginning at groundline or below with application rates varying with pole circumference. Diffusible rods can also be used to sterilize inspection holes and to control or prevent pole top decay.

8. Pole Restoration Systems: Systems are available to restore strength to deteriorated poles to extend their service life. These restoration systems are installed in contact with the pole to transfer load. They are used when a pole is weakened below allowable NESC or G.O. 95 strength requirements. In order to obtain an acceptable service life from a restoration system, the progression of decay must be limited or stopped; therefore it is important that these systems should be used in conjunction with remedial treatment systems. Any pole designated for enhancement should be evaluated by the Pole Owner considering need, cost, future line changes, etc. The systems under consideration should provide strength, durability and effectiveness. The Pole Owner should request test data regarding the strength of the system(s) being considered. The most common examples are pole stubs or metal trusses that are banded or bolted to the pole, other systems include encasements composed of metal, fiberglass or concrete.

9. Reinspection Frequency: Reinspection of the utility pole system should be done on an approximate 10 year cycle subject to the discretion of the utility company. Cycles may be shortened or lengthened based on pole performance history for that utility company.

10. Data Management: Pole records should be stored in a searchable database. This will allow the pole owner to query records by manufacturer, species, treatment etc. in order to compare relative performance. It also makes it possible to analyze causes of pole failures. This analysis may indicate necessary changes to new or in-service pole specifications in order to improve service life. Above ground defects as well as hardware defects can also be queried and analyzed.

Additional Sources of Information include:

Pole Inspection and Maintenance
Bulletin 1730B-121
U.S. Department Of Agriculture
Rural Utilities Service

Wood Pole Inspection Manual (1996 Edition)
Oregon State University
Corvallis, Oregon