



Standard Practice for Preservative Treatment of Utility Poles by the Thermal Process¹

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1. Scope

1.1 This practice covers the full-length preservative treatment of utility poles by the thermal process.

1.2 Poles furnished under this practice shall be limited to the following species:

- Douglas fir (*Pseudotsuga menziesii*),
- Lodgepole pine (*Pinus contorta*),
- Alaska yellow cedar (*Chamaecyparis nootkatensis*),
- Northern white cedar (*Thuja occidentalis*), and
- Western red cedar (*Thuja plicata*).

1.3 The purchaser should note that requirements both within and between species vary and care must be used in selection of specific options for the intended use and service area.

2. Referenced Documents

2.1 ASTM Standards:

- D 390 Specification for Coal-Tar Creosote for the Preservative Treatment of Piles, Poles, and Timbers for Marine, Land, and Fresh Water Use²
- D 1272 Specification for Pentachlorophenol²
- D 1860 Test Method for Moisture and Creosote-Type Preservative in Wood²
- D 2085 Test Method for Determining Chloride Used In Calculating Pentachlorophenol in Solutions or Wood (Lime Ignition Method)²
- D 2604 Specification for High-Boiling Hydrocarbon Solvent for Preparing Oil-Borne Preservative Solutions²
- D 3507 Test Methods for Penetration of Preservatives in Wood and for Differentiating Between Heartwood and Sapwood²

2.2 Other Standard:

- ANSI 05.1 American National Standard for Wood Poles-

Specifications and Dimensions³

AWPA Standard A5, Section 6 Determination of Pentachlorophenol in Oil or Wood by the Copper Pyridine Method⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *groundline or setting depth*—the groundline distance from the butt.

4. Description of Treating Process

4.1 The thermal treating process consists of at least two separate operations, namely the hot and cold (or cooling) cycles. A cold cycle is accomplished by removing the hot cycle preservative from the treating tank and replacing it with preservative at a lower temperature. A cooling cycle is accomplished by allowing the preservative of the hot cycle to remain in the treating tank and cool, or to cool the hot preservative by use of a heat exchanger piped to the treatment tank. In addition, a final expansion cycle with hot preservative may be applied.

4.2 At no time during the entire process shall the temperature of the preservative exceed 230°F (110°C).

5. Plant Equipment

5.1 Treating plants shall be equipped with thermometers, gages, clocks, recording devices, and related items to indicate and record accurately the conditions at all stages of the treating process. Such equipment shall be maintained in acceptable, working condition and be inspected for calibration and accuracy annually.

5.2 The apparatus and chemicals necessary for making the analyses and tests required shall be provided by plant operators and kept in condition for use at all times.

6. Prior to Treatment

6.1 *Seasoning*—Before treatment, poles shall be air seasoned, under proper sanitary conditions, or kiln dried as defined in ANSI 05.1, Paragraph 5.1.2.1, and 5.1.2.3 to minimize checking after treatment and to permit maximum

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Some requirements in this practice are similar to those in the Commodities Standards of the American Wood-Preservers' Association for full-length preservative treatment of utility poles by the thermal process with preservative materials and solutions. Acknowledgment is made to the American Wood-Preservers' Association for its development of subject matter used in this practice.

² *Annual Book of ASTM Standards*, Vol 04.10.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, N. Y. 10036.

⁴ Available from American Wood-Preservers' Association, P.O. Box 286, Woodstock, MD 21163-0286.

penetration and retention of preservative. Certain arid usage areas will require lower moisture contents than the values expressed in this practice.

6.1.1 *Determination of Moisture Content*—Prior to treatment, the moisture content of a charge or order (whichever is less in number) shall be determined by either of the following methods: (a) Use of an approved resistance type moisture meter equipped with insulated needles. The needles shall be driven to a depth equal to the minimum preservative penetration for standard treatments; (b) Oven-drying increment borer cores. The sample used shall be the aggregate depth equal to the minimum preservative penetration requirement for standard treatments dried to constant weight at 220°F (105°C).

6.1.2 *Location of Samples*—Determine meter readings at, or remove increment borer cores from, a point approximately halfway between the extreme top and extreme butt of the pole. Take borer cores to a depth equal to the minimum preservative penetration requirement for standard treatments.

6.1.3 *Basis of Calculation*—Express all moisture contents as a percentage of the oven-dry weight.

6.1.4 *Testing for Moisture Content*—If 100 % inspection for moisture content is not specified, test not less than 10 % of the poles in a charge, but in no case less than 12 poles. Test all Alaska yellow cedar poles for moisture content.

6.2 *Machine Shaving*—When so specified, poles shall be machine shaved their entire length. Shaving shall be kept to an absolute minimum while ensuring the removal of all inner bark. This operation may be in addition to peeling for bark removal at time of tree harvest.

6.3 *Incising*—In all incising operations, the wood shall not be splintered or loosened from the pole. The incisions shall be reasonably clean-cut and their spacing pattern and depth shall be such as to ensure uniform preservative to the required depth throughout the incised section. The depth of incising shall be at least as deep as the minimum preservative penetration required. In addition to the mandatory incising requirement, purchasers of poles for use in dry or arid areas may judge it desirable to also have the extreme butt area incised.

6.3.1 By agreement between the purchaser and the treater, aids to penetration of preservative on Douglas Fir poles such as deep incising and radial drilling and through boring shall be performed in the areas of the fir poles as specified by the purchaser. All drilling and boring will conform to the bit size and pattern specified by the purchaser.

6.4 *Framing*—All specified framing, boring, and related operations to be performed by the supplier shall be done prior to treatment.

7. Preservatives

7.1 *Pentachlorophenol*—When pentachlorophenol is specified as the preservative, the pentachlorophenol shall meet the requirements of Specification D 1272 and be dissolved in a solvent meeting the requirements of Specification D 2604.

7.2 *Creosote*—When creosote is specified as the preservative, it shall meet the requirements of Specification D 390.

8. Results of Treatment

8.1 *Location of Borings*—Take the increment borer cores used to test for penetration and retention conformity requirements at a point approximately 1 ft (300 mm) below the groundline.

8.2 *Penetration*—Specify penetration conformity as being based on either 100 % or selective inspection.

8.2.1 *Inspection 100 %*—Reject all poles failing to meet penetration requirements subject to retreatment.

8.2.2 *Selective Inspection*—Twenty poles shall be tested in each charge. If 18 of the borings meet penetration requirements, the charge as a whole shall be accepted, but the non-conforming poles shall be rejected subject to retreatment. If 17 or less of the borings meet requirements, each pole in the charge shall be bored, and only those poles meeting the requirements shall be accepted, or at the discretion of the plant operator, the entire charge may be retreated.

8.2.3 *Distinguishing Heartwood and Sapwood*—In order to test for penetration conformity in Lodgepole pine or Douglas fir, it may be necessary to use approved staining procedures to distinguish between the sapwood and heartwood. See Test Methods D 3507.

8.3 *Retention*—Preservative retention values shall be the aggregate average for the assay zone specified of the first 20 increment borer cores that are in good physical condition. No portion of any borer core that has been subjected to heartwood-sapwood indicator may be used for retention determination. Reject all poles from any charge or lot failing to meet minimum preservative retention requirements, subject to retreatment.

8.3.1 Determine pentachlorophenol retentions using Test Method D 2085 or AWP Standard A5, Section 6.

8.3.2 Determine creosote retention using Test Method D 1860.

8.4 *Plugging of Increment Borer Holes*—Fill all increment borer holes made to test for penetration, retention, and moisture content conformity with tight-fitting cylindrical wood plugs that have been thoroughly preservative treated.

9. Specific Requirements

9.1 The following specific requirements and options are listed in Table 1 (inch-pound units) and Table 2 (International System of Units):

- 9.1.1 Species,
- 9.1.2 Seasoning,
- 9.1.3 Incising,
- 9.1.4 Treating cycle,
- 9.1.5 Preservative, and
- 9.1.6 Treatment results:
 - ((a) Penetration,
 - ((b) Retention.

9.2 *Ordering Information*—The purchaser shall state species, preservative, 100 % or selective penetration inspection, standard, or extra treatment, and any exceptions being taken to this specifications.

9.3 *Certified Test Report*—When specifically requested by the purchaser, the supplier shall furnish a certified test report. This report shall certify that the poles have been inspected and

TABLE 1 Requirements for the Treatment of Utility Poles by the Thermal Process (Inch-Pound Units)

	Douglas Fir		Lodgepole Pine		Alaska Yellow Cedar Northern White Cedar Western Red Cedar	
Seasoning:						
(a) Moisture meter depth and % OD	¾ in. 23 % max any pole avg 19 % for lot		¾ in. 23 % max any pole avg 19 % for lot		½ in. 25 % max any pole avg 20 % for lot	
(b) Borer cores; min penetration and % OD	max avg 19 % of all poles		max avg 19 % of all poles		max avg 20 % of all poles	
Incising						
	From 3 ft below to 6 ft above groundline		Optional		Poles less than 50 ft from 2 ft below to 1 ft above groundline Poles 50 ft and longer from 3 ft below to 3 ft above ground line	
Treating:						
Hot cycle						
Temperature max	230°F		230°F		230°F	
Temperature min	212°F		190°F		190°F	
Time min	20 h		No min		No min	
Cold cycle						
Expansion cycle	230°F max		230°F max		230°F	
Preservative						
Specify either	Pentachlorophenol Creosote		Pentachlorophenol Creosote		Pentachlorophenol Creosote	
Treating results:						
	Standard	Extra	Standard	Extra	Standard	Extra
(a) Penetration (Both preservation)	0.75 in. min and 85 % sapwood	1.50 in. min and 85 % sapwood	0.75 in. min and 85 % sapwood	0.75 in. min and 85 % sapwood	0.50 in. or 100 % sapwood	0.63 in. or 100 % sapwood
(b) Retention						
Pentachlorophenol	0.6 PCF	0.8 PCF	0.6 PCF	0.8 PCF	1.0 PCF ^A	1.25 PCF ^A
Creosote	12 PCF	16 PCF	12 PCF	16 PCF	20 PCF ^A	25 PCF ^A
Location of boring for Penetration and retention tests	1 ft below groundline		1 ft below groundline		1 ft below groundline	
Assay zone—Distance from surface	0.25 to 1.00 in.		0.10-0.75 in.		0.0 to 0.50 in.	
No. of borer cores	20		20		20	

^A Retention values for the cedars are in terms of weight per unit volume of sapwood in the samples assayed.

tested in accordance with the requirements of this specification. It shall state the actual penetrations and retentions for each charge or lot and that all requirements of selected options have been met.

10. Keywords

10.1 poles; preservative; thermal; treatment

TABLE 2 Requirements for the Treatment of Utility Poles by the Thermal Process (International System of Units)

	Douglas Fir	Lodgepole Pine	Alaska Yellow Cedar Northern White Cedar Western Red Cedar			
Seasoning:						
(a) Moisture meter lot depth and % OD	19 mm 23 % max any pole avg 19 % for lot	19 mm 23 % max any pole avg 19 % for lot, depth and % OD	13 mm 25 % max any pole avg 20 % for lot			
(b) Borer cores; min penetration and % OD	max avg 19 % of all poles	max avg 19 % of all poles	max avg 20 % of all poles			
Incising	From 910 mm below to 1830 mm above groundline	Optional	Poles less than 15 m from 610 mm below to 300 mm above groundline Poles 15 m and longer from 910 mm below to 910 mm above groundline			
Treating						
Hot cycle						
Temperature max.	110°C	110°C	110°C			
Temperature min	100°C	88°C	88°C			
Time min	20 h	No min	No min			
Cold cycle						
Expansion cycle	No limitation	No limitation	No limitation			
	110°C	110°C	110°C			
Preservative						
Specify either	Pentachlorophenol Creosote	Pentachlorophenol Creosote	Pentachlorophenol Creosote			
Treating results:						
	Standard	Extra	Standard	Extra	Standard	Extra
(a) Penetration (Both preservatives)	19 mm min and 85 % sapwood	38 mm min and 85 % sapwood	19 mm min and 85 % sapwood	19 mm min and 85 % sapwood	13 mm min or 100 % sapwood	16 mm min or 100 % sapwood
(b) Retention						
Pentachlorophenol	9.6 kg/m ³	12.8 kg/m ³	9.6 kg/m ³	12.8 kg/m ³	16 kg/m ^{3A}	20 kg/m ^{3A}
Creosote	192 kg/m ³	256 kg/m ³	192 kg/m ³	256 kg/m ³	320 kg/m ^{3A}	400 kg/m ^{3A}
Location of borings for penetration and retention tests	300 mm below groundline		300 mm below groundline		300 mm below groundline	
Assay zone—Distance from surface	6.4 to 25.0 mm		2.5 to 19 mm		0.00 to 13 mm	
No. of borer cores	20		20		20	

^A Retention values for the cedars are in terms of weight per unit volume of sapwood in the samples assayed.

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