

## 1. Scope

This Material Standard describes the minimum acceptable requirements for full length pressure treated Pacific Coast Douglas Fir and Western Red Cedar poles produced for and delivered to the District as specified in the attached Special Provision Sheet. Where there is conflict between this Material Standard and any other standard referred to herein, this Material Standard shall govern.

Unless otherwise specified by the District, poles supplied under this Material Standard shall be produced by plants currently approved by Wood Quality Control (WQC), Incorporated.

## 2. Reference Standards

Except where provisions conflict with the requirements of this Material Standard, poles shall meet all applicable provisions of the latest revisions of the following standards:

ANSI O5.1	Specifications and Dimensions for Wood Poles
AWPA A9	Standard Methods for Analysis of Treated Wood and Treating Solutions by X-Ray Spectroscopy
AWPA A71	Standard Methods for Determining Penetration of Solvent Used with Oil-Soluble Preservatives
AWPA A76	Standard Methods for Determining Penetration of Copper-Containing Preservatives
AWPA M1	Standard for the Purchase of Treated Wood Products
AWPA M2	Standard for Inspection of Wood Products Treated with Preservatives
AWPA M4	Standard for the Care of Preservative-Treated Wood Products
AWPA P8	Standard for Oil-Borne Preservatives
AWPA P9	Standards for Solvents and Formulations for Organic Preservative Systems
AWPA P36	Standard for Copper Naphthenate (CuN)
AWPA P39	Standard for 4,5-Dichloro-2N-Octyl-4-Isothiazolin-3-One (DCOI)
AWPA T1	Use Category System: Processing and Treatment Standard, 8.D. Special Requirements - Poles
AWPA U1	Use Category System: User Specification for Treated Wood, 6.D. Commodity Specifications - Poles

## 3. Definitions

ANSI	American National Standards Institute
AWPA	American Wood Protection Association
CuN	Copper Naphthenate
DCOI	4,5-Dichloro-2N-Octyl-4-Isothiazolin-3-One
WCLIB	West Coast Lumber Inspection Bureau

## **4. Dimensions**

The length and class of poles to be provided will be specified in the attached Special Provision Sheet.

### **4.1 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.

Pole length shall be measured between the extreme ends of the pole.

### **4.2 Circumference**

The circumferences for the class of poles specified by the District shall conform to the requirements specified in ANSI O5.1, Section 6.2.2

### **4.3 Classification**

The true pole circumference class shall be determined as specified in ANSI O5.1, Section 6.3.

## **5. Rate of Growth**

The average rate of growth measured on the butt in the outer 3-inches shall be not less than six rings per inch. The only exception is that poles with four and five rings per inch will be acceptable if 50-percent or more summerwood is present.

## **6. Prohibited Defects**

Poles shall be free of the following defects, as defined in ANSI O5.1:

**6.1** Cross Breaks (Cracks)

**6.2** Decay, except as permitted for firm red heart, defective butts, and decayed knots in ANSI O5.1, Sections 5.3.1, 5.4.4 and 5.4.6, respectively

**6.3** Dead Streaks, except as permitted in section ANSI O5.1, Section 5.4.3

**6.4** Holes, open or plugged, except holes for test purposes, which shall be plugged with a treated plug

**6.5** Hollow Butts or Tops

**6.6** Marine Borer Damage

**6.7** Nails, Spikes, and Other Metal not specifically authorized by the District

## 7. Limited Defects

The following limited defects will be allowed, as defined in ANSI O5.1:

### 7.1 Bark Inclusions

### 7.2 Compression Wood

### 7.3 Dead Streaks

### 7.4 Defective Butts

### 7.5 Insect Damage

### 7.6 Knots

Knots shall be permitted as defined in ANSI O5.1 with the following clarifications:

**7.6.1** The diameter of any single knot and the sum of knot diameters in any 1-foot section shall not exceed the limits stated in ANSI O5.1, Table 2.

**7.6.2** In determining the sum of the knot diameters in any 1-foot section, only those knots with diameters greater than 1/2-inch shall be included in the sum, and the 1-foot section shall be located so as to include the maximum number of knots, i.e., the most severe condition.

**7.6.3** As defined in ANSI O5.1, Section 3.10, Type I decayed knots are not permitted; Type II decayed knots are permitted.

### 7.7 Scars

### 7.8 Shakes

### 7.9 Shape

Poles shall be shaped in accordance with ANSI O5.1, with the exception that poles with sweep in 2 planes (double sweep) will not be accepted.

### 7.10 Spiral Grain

Poles having spiral grain (twist grain) in excess of one complete twist in any 20-foot length of pole will not be accepted. This restriction applies to all pole lengths.

### 7.11 Splits and Checks

Splits and Checks shall meet the requirements as defined in ANSI O5.1

### 7.12 Correction of Split Top

Upon mutual agreement between the pole manufacturer and the independent inspector, an anti-splitting device, such as a Star-Lock, may be used to prevent a pole from becoming a reject due to a split or check(s) in its top. An anti-splitting device shall not be used to correct a pole top after a pole has been rejected due to a split or check(s) in its top. The size and type of anti-splitting device required shall be determined jointly by the pole manufacturer and the independent inspector.

## 8. Permitted Defects

The following defects are permitted as defined in ANSI O5.1:

8.1 Firm Red Heart

8.2 Sap Stain

## 9. Manufacturing Requirements

All work shall be performed by skilled craftsmen following the best modern practices of the industry.

### 9.1 Bark Removal

Bark shall be removed in accordance with ANSI O5.1.

### 9.2 Sawing

9.2.1 All poles shall be neatly sawn 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 sawn butt surface not more than 1/12 the butt diameter in width, or an equivalent area unsymmetrically located, is permitted.

9.2.2 All poles shall be neatly sawn at the top with a single saw cut. The pole top shall be flat across with no slope, i.e., sawn at a right angle to the face of the pole.

### 9.3 Trimming

Trimming shall be in accordance with ANSI O5.1.

### 9.4 Incising

9.4.1 The ground line of the pole shall be defined as shown in Table 2 in Section 17 of this Material Standard.

9.4.2 Douglas Fir poles shall be incised 1/2-inch minimum depth for the entire length of the pole prior to treatment.

9.4.3 Western Red Cedar poles shall be incised throughout that portion of the pole surface terminating 1-foot above and 2-feet below the ground line prior to treatment.

9.4.4 Incisions shall be reasonably clean cut and their spacing, pattern and depth shall be made so as to ensure uniform penetration of the preservative to the required depth throughout the incised area.

9.4.5 The sapwood shall not be splintered or loosened from the heartwood in the incising operation.

## 9.5 Through-Boring to Enhance Preservative Penetration

**9.5.1** The ground line area and top 2-feet of Douglas Fir poles shall be through-bored prior to treatment to enhance penetration of the preservative into the pole per the requirements of this Material Standard, see Section 17 for reference:

1. Detail "A" Pattern for Through-Boring Template
2. Detail "B" Ground Line Through-Boring Zone
3. Table 1 Through-Boring Instructions
4. Table 2 Ground Line Distance from Butt

**9.5.2** Through-boring will not be required for full-length pressure treated Western Red Cedar poles.

**9.5.3** Through-boring shall be done carefully to avoid charring or glazing of the inner surfaces.

**9.5.4** All through-bore holes shall be completely bored through the pole from one direction. Through-bore holes shall be 7/16-inch diameter. The edge distance for through bore holes shall be 2 +/- 1/2 inch.

**9.5.5** All ground line through-boring shall be done on the face of the pole and all pole top through-boring shall be done at 45-degrees to the face of the pole.

## 9.6 Marking

**9.6.1** The butt of all poles shall be marked with a flooring axe bearing the 3/4-inch block letters "P.U.D." The length, in feet, of each pole shall be clearly marked on the butt in the same manner.

**9.6.2** Each pole shall be marked as specified in ANSI O5.1 by two aluminum or stainless steel discs. Each disc shall have stamped or embossed thereon the supplier's code or trademark; the plant location and the year of treatment; code letters denoting the pole species and preservative used; and the true circumference-class numeral and numerals showing the length of the pole. The discs shall be approximately 2-inches in diameter. The discs shall be punched with a nail hole, placed in the marking disc recesses on the pole face and butt, and attached with 2-inch aluminum twist nails.

**9.6.3** The top of each pole shall have a permanent tag attached, which will indicate what treatment was used to treat the pole.

## 9.7 Butt Gain

A neatly cut gain 2-inches wide and 1/2-inch deep (at its center) shall be provided on the face of the pole at the distance given below. This distance shall be measured from the butt of the pole to the center of the gain. The face of the pole shall be as defined in ANSI O5.1.

Length of Pole	Distance of Butt Gain from Bottom of Pole
Less than or equal to 85 ft	12 ft
Greater than 85 ft	15 ft

## 9.8 Framing

**9.8.1** Additional gains shall be cut and holes bored in accordance with Figures 1 through 4 which correspond to the pole length specified in the attached Special Provision Sheet. All gains shall be neatly cut and bore holes shall be neatly drilled and cleaned so that they are completely open.

<b>Figure</b>	<b>Length of Pole</b>
1	30 ft, 35 ft
2	40 ft, 45 ft, 50 ft, 55 ft, 60 ft
3	30 ft Class 6 Yard Light Pole
4	65 ft and Longer

**9.8.2** All gains shall be cut and holes bored before poles are treated.

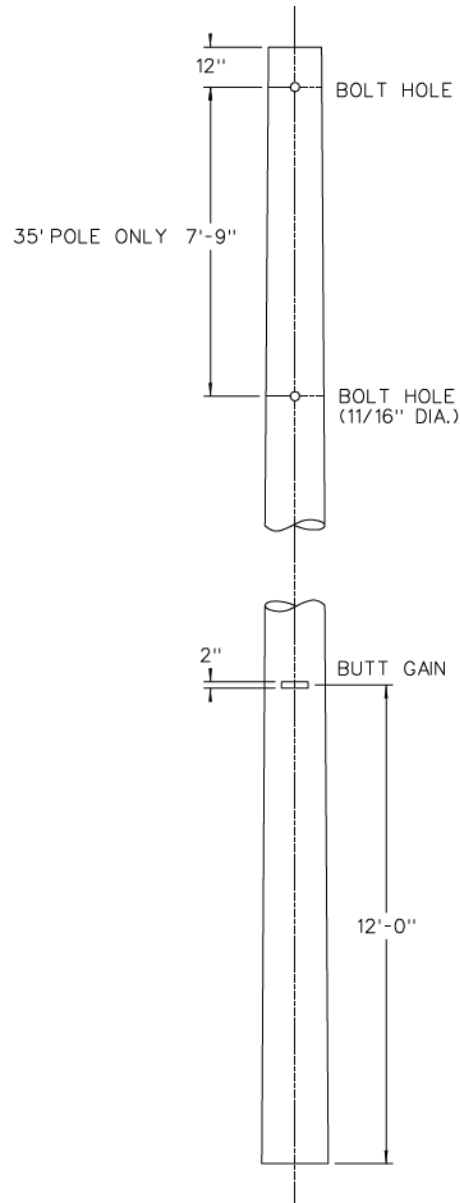
**9.8.3** All gains shall be cleanly and neatly cut.

**9.8.4** All bolt holes shall be parallel with or perpendicular to each other, as appropriate. All bolt holes shall be bored through the true axis of the pole using sharp drill bits. All bore holes shall be cleaned so they are completely open prior to treatment.

**FIGURE 1: Framing Details for 30 and 35 ft Poles**

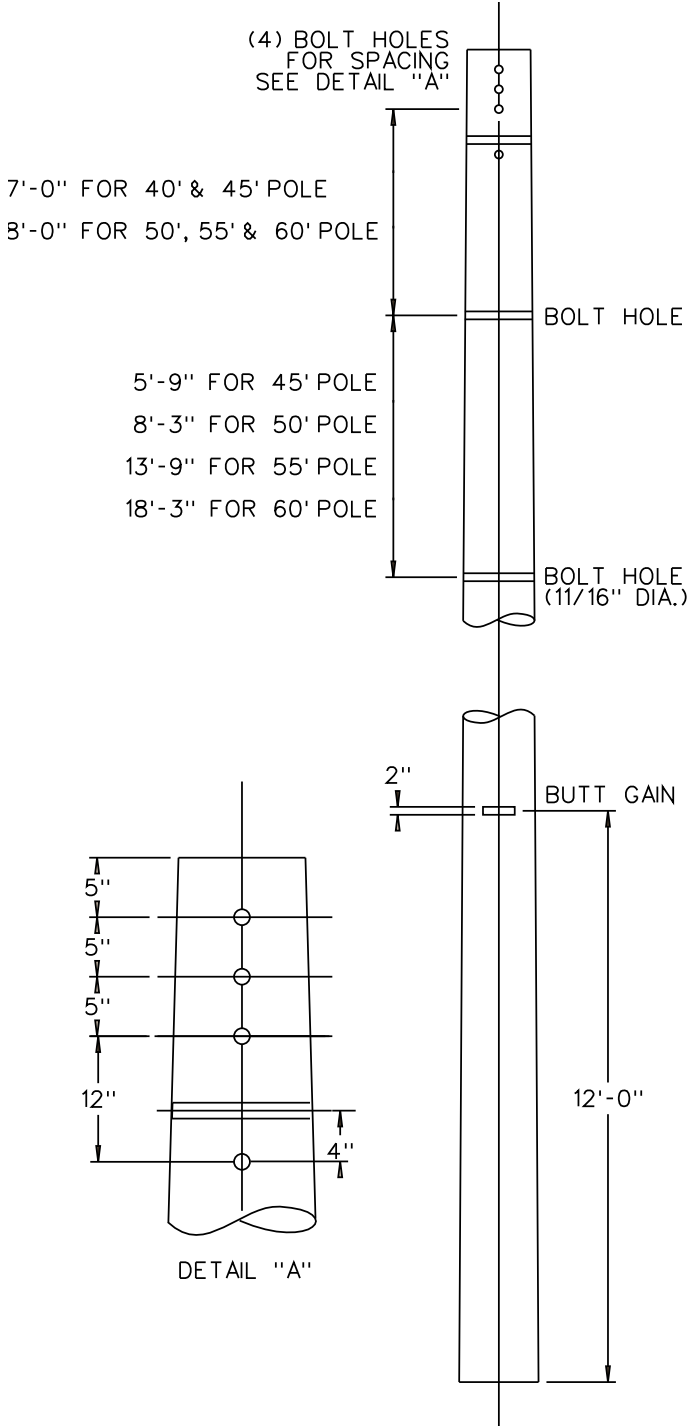
1. Any pole having a curvature or sweep shall be gained on the inside of the sweep so that when the pole is set the curvature will be parallel with the pole line.
2. The Butt Gain shall be 2" wide with a center depth of 1/2" and be in the same plane and at right angles to bolt holes.
3. After treatment, bolt hole diameters shall be as shown below:

Pole Length	Bolt Hole Dia.
30 ft	13/16"
35 ft	11/16"



**FIGURE 2: Framing Details for 40, 45, 50, 55 and 60 ft Poles**

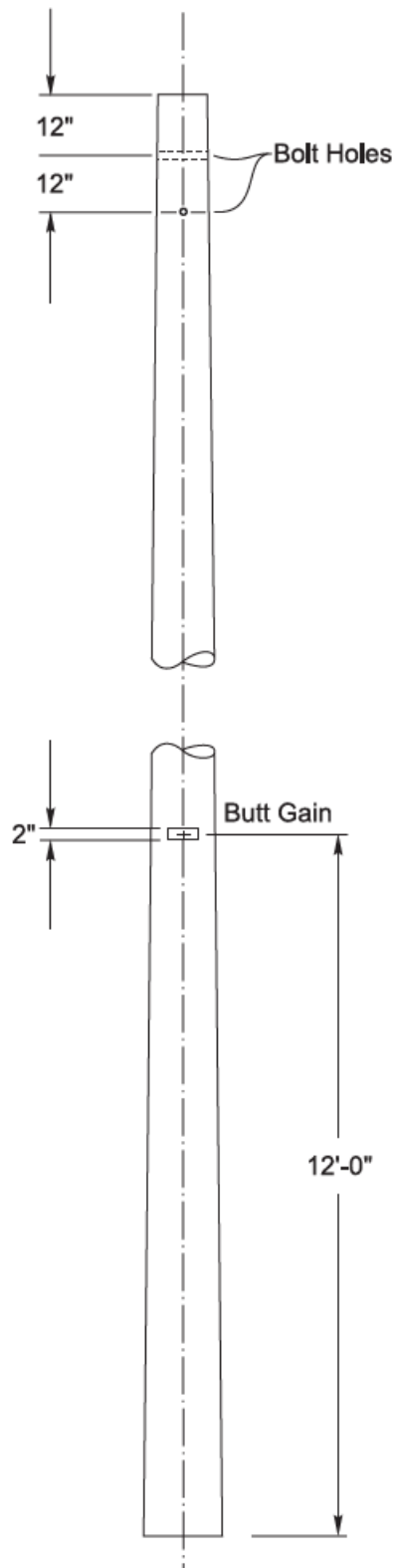
1. Any pole having a curvature or sweep shall be gained on the inside of the sweep so that when the pole is set the curvature will be parallel with the pole line.
2. The Butt Gain shall be 2" wide with a center depth of 1/2" and in the same plane and at right angles to bolt holes.
3. After treatment, all bolt holes shall have a diameter of 11/16" minimum, 13/16" maximum, except as otherwise indicated on the drawing.





**FIGURE 3: Framing Details for 30 ft Class 6 Yard Light Pole**

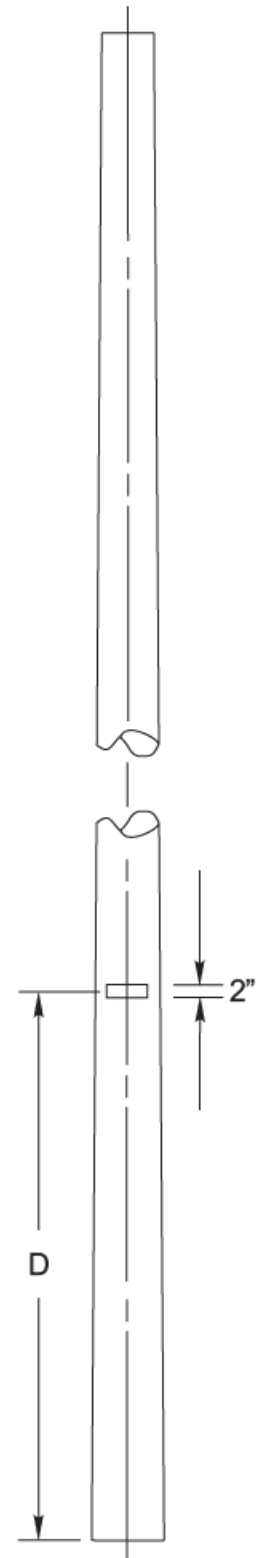
1. Any pole having a curvature or sweep shall be gained on the inside of the sweep so that when the pole is set the curvature will be parallel with the pole line.
2. The Butt Gain shall be 2" wide with a center depth of 1/2".
3. After treatment, all bolt holes shall have a diameter of 11/16" minimum, 13/16" maximum.



**FIGURE 4: Framing Details for Poles 65 ft and Longer**

1. Any pole having a curvature or sweep shall be gained on the inside of the sweep (pole face) so that when the pole is set the curvature will be parallel with the pole line.
2. The Butt Gain shall be 2" wide with a center depth of 1/2".
3. The distance from the butt to the center line of the gain shall be as shown below:

Pole Length	Dimension D
65 - 85 ft	12 ft
> 85 ft	15 ft



## 10. Conditioning

**10.1** Poles shall be cut from live timber within 6-months prior to delivery and air seasoned over a minimum period of 3-months prior to treatment.

**10.2** The moisture content of seasoned poles shall be less than 30-percent before the poles are treated.

**10.3** During final seasoning by Boulton drying, the temperature shall be limited to 220°F for Pacific Coast Douglas Fir and to 200° F for Western Red Cedar in accordance with ANSI O5.1, Section 5.1.2.

## 11. Treatment

### 11.1 Best Management Practices

Poles shall be treated in compliance with the Best Management Practices for the Use of Treated Wood in Aquatic Environments, (Western Wood Preservers Institute 1996) and certified in compliance by a third party quality inspection agency.

### 11.2 Preservative

The preservative shall be copper naphthenate solution meeting the requirements of AWPA P8, P9 and P36, or DCOI meeting the requirements of AWPA P8, P9, and P39.

### 11.3 Solvents and Co-Solvents

If an organic preservative system is used, the solvent and any co-solvents shall conform to AWPA P9 Type A. The solvent and any co-solvents shall have the lowest concentration of polycyclic aromatic hydrocarbons (PAHs) possible, and shall not trigger the Washington Department of Ecology carcinogenic PAH testing requirement outlined under WAC 173-340-900 (Table 830-1) or as otherwise determined by the Department of Ecology.

### 11.4 Penetration

**11.4.1** Penetration of copper naphthenate in the sapwood shall be a minimum of 3/4-inch (and 85-percent) in Pacific Coast Douglas Fir and a minimum of 1/2-inch (or 100-percent) in Western Red Cedar in accordance AWPA T1

**11.4.2** Penetration of DCOI in the sapwood shall be a minimum of 3/4-inch (and 85-percent) in Pacific Coast Douglas Fir in accordance AWPA T1

### 11.5 Retention

Treating shall be by the empty-cell process in accordance with AWPA U1, Use Category 4B. Minimum retention of preservative for full length pressure treated poles shall be as shown below and as determined by the method described in AWPA A9 for concentration in both copper naphthenate and DCOI and AWPA A71 for penetration in DCOI and AWPA A76 for penetration in copper naphthenate.

Species	Oil-Type Preservative Retentions (pcf)	
	Copper Naphthenate Cu as metal	DCOI
Coastal Douglas Fir	0.095	0.200
Western Red Cedar	0.120	N/A

## 11.6 Retreatment

Poles may be retreated once providing none of the retreatment limitations specified in AWPA T1 are exceeded.

## 11.7 Cleanliness

After treatment all poles shall be clean and dry (moisture content shall be 25-percent or less) and shall remain in that condition. Bleeders will be rejected.

## 12. Storage and Handling

Storage and handling of poles shall be in accordance with ANSI O5.1.

## 13. Inspection

Poles shall be inspected in accordance with the requirements of the Wood Quality Control (WQC) program.

## 14. Rejection

Poles not conforming to this Material Standard and poles received bleeding, damaged or broken will be rejected.

The supplier shall appropriately dispose of rejected poles at supplier's own expense.

## 15. Delivery

**15.1** Poles shall be delivered to and unloaded at any storage site within the District's service area as specified in the attached Special Provision Sheet.

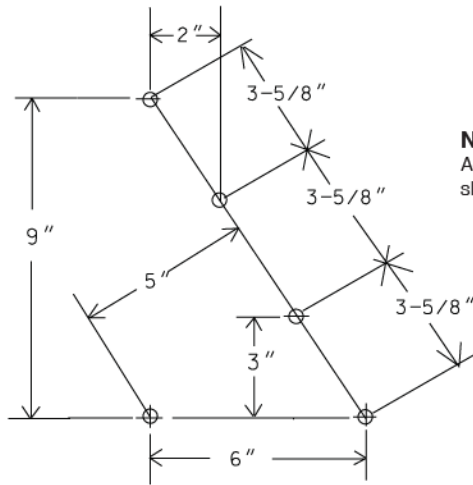
**15.2** All shipments shall arrive at the District with capabilities for self-unloading, i.e., shall have a self-sufficient means of unloading.

## 16. Evaluation of Bids

All bids will be evaluated on delivery schedules, initial costs, escalations, past performance of supplier and product quality.

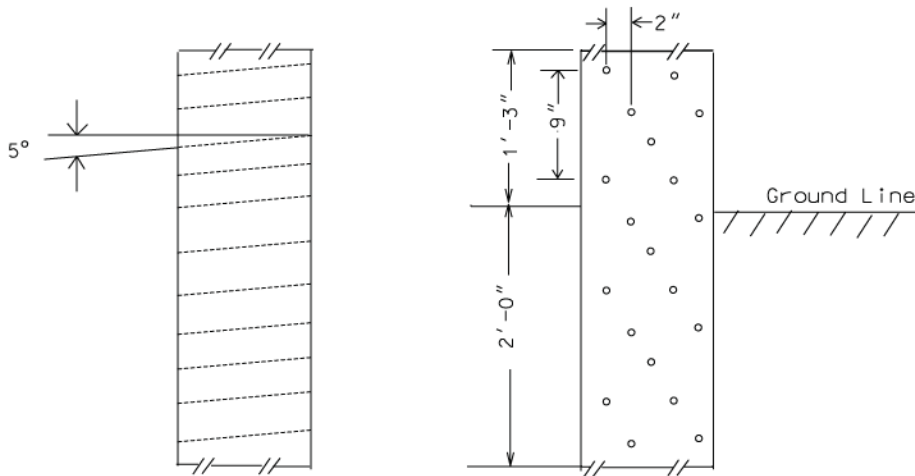
## 17. General Bidding Conditions

The attached General Bidding Conditions are made a part of this Material Standard.



**Note:**  
All through-boring holes shall be 7/16" diameter.

**DETAIL "A"**  
**Pattern for Through-Boring Template**



**DETAIL "B"**  
**Ground Line Through-Boring Pattern**

**Table 1: Through Boring Instructions**

Pole Diameter (in.)	Number of Rows at 2 in. Spacing	Edge Distance (in.)	Pole Diameter (in.)	Number of Rows at 2 in. Spacing	Edge Distance (in.)
8	3	2	15	7	1-1/2
8-1/4	3	2-1/8	15-1/4	7	1-5/8
8-1/2	3	2-1/4	15-1/2	7	1-3/4

Pole Diameter (in.)	Number of Rows at 2 in. Spacing	Edge Distance (in.)	Pole Diameter (in.)	Number of Rows at 2 in. Spacing	Edge Distance (in.)
8-3/4	3	2-3/8	15-3/4	7	1-7/8
9	4	1-1/2	16	7	2
9-1/4	4	1-5/8	16-1/4	7	2-1/8
9-1/2	4	1-3/4	16-1/2	7	2-1/4
9-3/4	4	1-7/8	16-3/4	7	2-3/8
10	4	2	17	8	1-1/2
10-1/4	4	2-1/8	17-1/4	8	1-5/8
10-1/2	4	2-1/4	17-1/2	8	1-3/4
10-3/4	4	2-3/8	17-3/4	8	1-7/8
11	5	1-1/2	18	8	2
11-1/4	5	1-5/8	18-1/4	8	2-1/8
11-1/2	5	1-3/4	18-1/2	8	2-1/4
11-3/4	5	1-7/8	18-3/4	8	2-3/8
12	5	2	19	9	1-1/2
12-1/4	5	2-1/8	19-1/4	9	1-5/8
12-1/2	5	2-1/4	19-1/2	9	1-3/4
12-3/4	5	2-3/8	19-3/4	9	1-7/8
13	6	1-1/2	20	9	2
13-1/4	6	1-5/8	20-1/4	9	2-1/8
13-1/2	6	1-3/4	20-1/2	9	2-1/4
13-3/4	6	1-7/8	20-3/4	9	2-3/8
14	6	2	21	10	1-1/2
14-1/4	6	2-1/8	21-1/4	10	1-5/8
14-1/2	6	2-1/4	21-1/2	10	1-3/4
14-3/4	6	2-3/8	21-3/4	10	1-7/8

**Notes:**

1. All ground Line through-boring shall be done on the face of the pole, and all pole top through-boring shall be done at 45 degrees to the face of the pole.
2. The pole top through-boring pattern shall be similar to Detail "B" but shall extend only 2 feet down from the top of the pole.
3. All through-boring shall be done prior to treatment.
4. All holes shall be completely bored through from one direction.

Table 2: Ground Line Distance from Butt

Pole Length (ft)	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
Ground Line (ft)	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5