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The Soaking Method for the Preservative Treatment of Fence Posts

By

Robert D. Graham

OREGON FOREST PRODUCTS LABORATORY

State Board of Forestry and School of Forestry,
Oregon State College Cooperating
Corvallis

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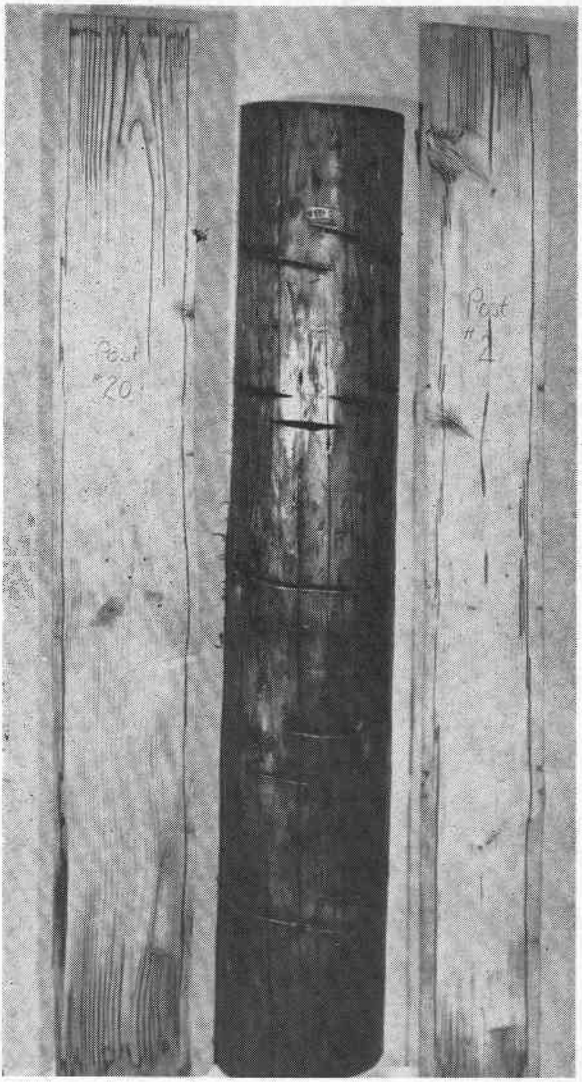


Treated Foundation Posts for Seasoning Rack

Incised, seasoned Douglas-fir posts were soaked in a preservative-diesel oil solution using the reversing-end method and a soaking time of six days for each end. The penetrations are outlined in black. Very nearly complete sapwood penetration was obtained. The average retention of the 60 posts in the charge was 2.9 pounds per cubic foot.

The Soaking Method for the Preservative Treatment of Fence Posts

SUMMARY

The soaking method for the preservative treatment of fence posts consists of immersing seasoned, preferably incised, wood posts in preservative solutions to the desired depth for a sufficient length of time to secure a uniformly treated outer shell of wood. Water-soluble and oil-soluble preservatives may be used; but under the severe service conditions to which fence posts are subjected, water-soluble preservatives may be leached quite rapidly from the wood. For this reason, the discussion has been limited largely to the more permanent oil-soluble preservatives.

The soaking method can be used successfully for the preservative treatment of the sapwood of many Oregon tree species. Posts properly treated should provide a useful service life of 15 years. The results attained by this method will depend largely on the care with which the material is prepared for treatment and, at best, cannot be expected to compare with those of pressure processes in which higher preservative retentions and deeper penetrations are usually obtained.

For best results, the following procedure for preparing and treating posts is recommended:

1. Slope the tops of the posts as they are cut.
2. Separate the posts by species as they are peeled.
3. Incise the posts to a depth of at least one-half inch.
4. Season the posts until splits and checks open.
5. Include only posts of one species and one seasoning condition in each treating charge.
6. Inspect the posts to determine when treatment is complete.

Marked variations in the receptiveness of the material to treatment and the wide range in seasoning conditions make it virtually impossible to establish definite treating schedules for any species.

CAUSES OF POST FAILURE

Fence posts and other wood products in contact with the ground are subject to severe and virtually continuous attack by wood-destroying organisms and to the constant effects of mechanical and chemical deterioration. The destruction of the wood is accelerated greatly at the ground-line zone (about 6 inches above to 12 inches below the ground level) where moisture, air, and temperature conditions favorable to insects and fungi prevail. It is in this section that fungus and insect attacks usually begin. Also, in this zone preservatives are most subject to removal by leaching and by mechanical erosion of the outer layers of the treated wood. Deterioration may, under moist climatic conditions, begin in the tops of the posts, though the rate of deterioration is usually much slower than in the ground-line section. The sides of the posts above the ground-line zone are least subject to deterioration.

OBJECTIVES OF PRESERVATIVE TREATMENTS

Preservative treatment with proper toxic chemicals renders wood resistant to insect or fungus attack. Since it is seldom possible or economically feasible to impregnate wood completely, the treatment is more or less restricted to an outer layer of wood (Frontispiece), which must be treated uniformly to a depth sufficient to withstand the continuous action of the many agencies of deterioration.

FACTORS AFFECTING TREATMENT

The preservative treatment of wood is influenced by numerous factors that determine the limitations of the method employed and explain the great variations in the penetration and retention of the preservative solution.

Anatomical structure

The stem of a tree, when crosscut and viewed from the end, reveals several distinct features. These include, in order of their occurrence towards the center of the tree, the outer bark, inner bark, sapwood, heartwood, and pith. The outer bark serves as a protective covering to prevent mechanical damage and evaporation of water. The thin inner bark serves to distribute food, which has been manufactured in the leaves, to a single layer of growing cells that produce new wood and new inner bark. The sapwood, consisting of living, dying, and dead cells, conducts soil nutrients in water solution to the leaves for conversion into food for cell growth. The wood of young trees may be composed entirely of sapwood. The heartwood, which once was sapwood, consists of dead cells. Because of the extractives it contains, it is often much darker in color than sapwood.

The pith, usually found near the center of the cross section of the tree trunk, consists of a small core of cells that serve to store food, particularly for the growing tips of the stem and branches.

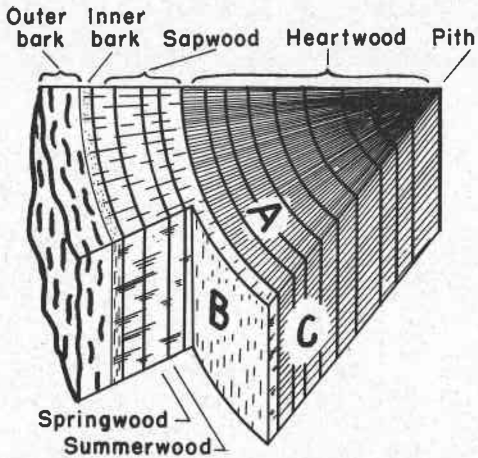
The wood of trees grown in temperate climates contains annual rings. Cell growth in such climates is not continuous because trees are dormant in the winter. This discontinuity of growth produces the annual rings, each of which has two parts, the springwood and the summerwood. The springwood, which is formed during the early part of the growing season, is composed of relatively large thin-walled cells, but the later-formed summerwood consists of smaller, thick-walled cells.

Wood is composed of many types of cells that vary greatly in size and structure. The hardwoods (Figure 1) contain more kinds of cells than the softwoods (Figure 2). The softwoods principally contain tracheids, commonly called fibers, which conduct nutrients and strengthen the stem, and special cells (wood rays) for the distribution and storage of food. Some have resin canals (intercellular spaces) that may or may not be plugged with resin. The hardwoods have similar cells for the storage of food, but they have specialized cells for the conduction of nutrients (vessels or pores) and for strength (fibers). The vessels may be fairly uniform in size and well distributed throughout the wood, as in alder or maple, or they may vary greatly in size, the largest ones being confined to the springwood, as in oak and ash. These vessels form nearly continuous vertical openings in the wood, though in some species, such as white oak, they may be plugged with cyst-like structures, called tyloses.

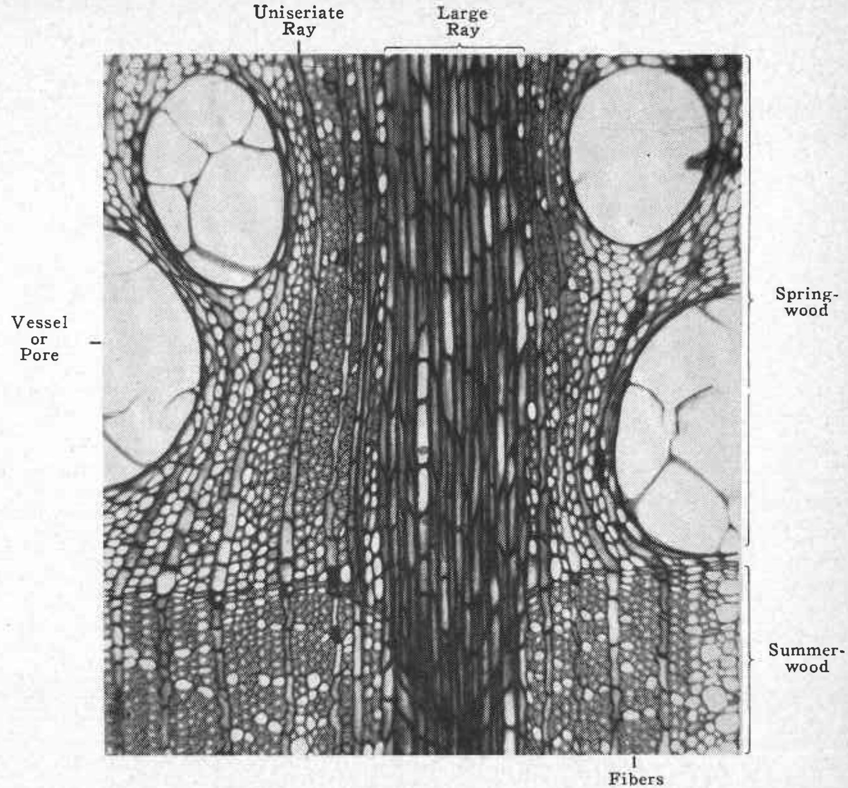
Moisture and food materials pass from one cell to another through thin places in the cell walls. These thin places are called pits. Summerwood cell walls have fewer and smaller pits than those of the springwood.

Penetration of preservative solutions

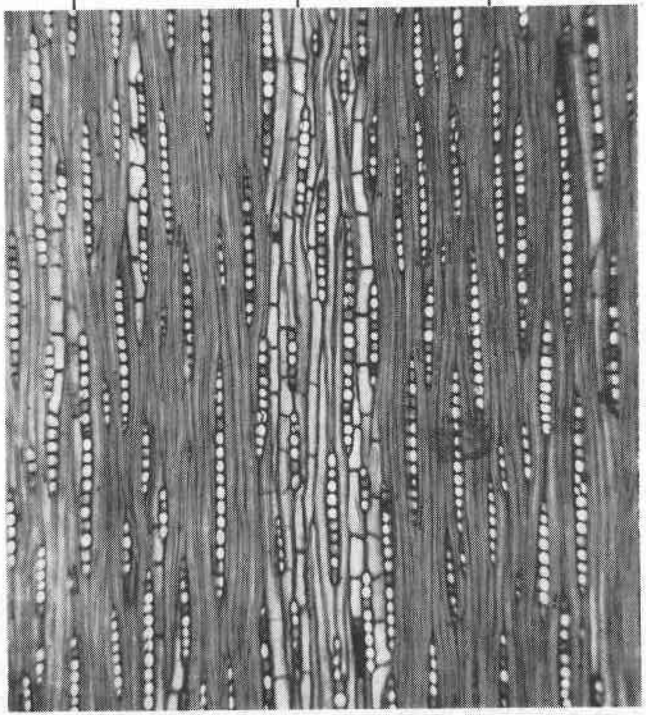
The preservative solution may penetrate the wood through unplugged resin canals and vessels, pits, small checks in the cell wall, and directly through the cell wall. The rate of penetration is affected by the size and number of the various cell structures and by the thickness and permeability of the cell walls. As the longest axes of most of the cells are in a vertical plane, the penetration will be more rapid in this longitudinal direction because of the smaller number of cell walls through which the preservative must pass. Longitudinal penetration has been estimated to be from 7 to more than 25 times as great as radial penetration (across the annual rings) or tangential penetration (around an annual ring). The longitudinal penetrations in the sapwoods of several species are indicated in Table 1.



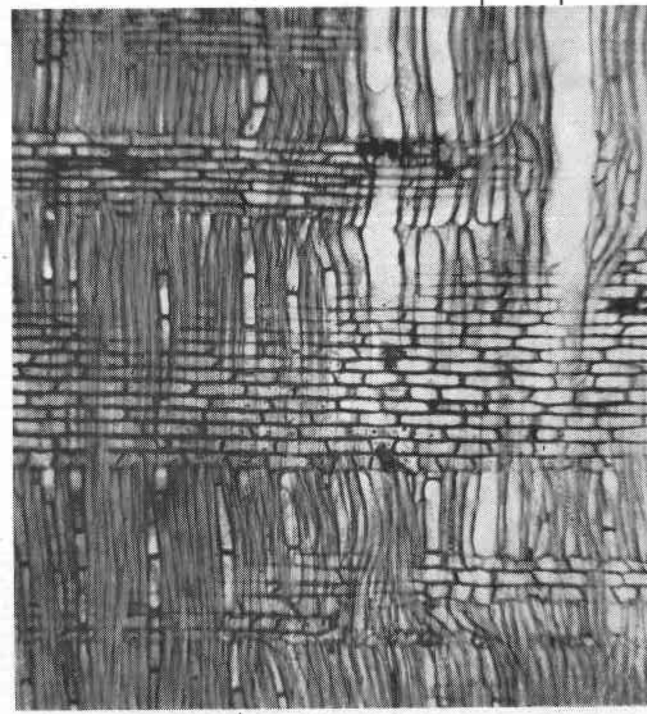
Sketch showing the relative positions of the wood sections from which the photographs were taken. A—Cross Section. B—Tangential Section. C—Radial Section.



A. Cross section showing four large pores in the springwood, a large wood ray in the center, numerous uniseriate wood rays, and thick walled wood fibers. The pores contain tyloses.

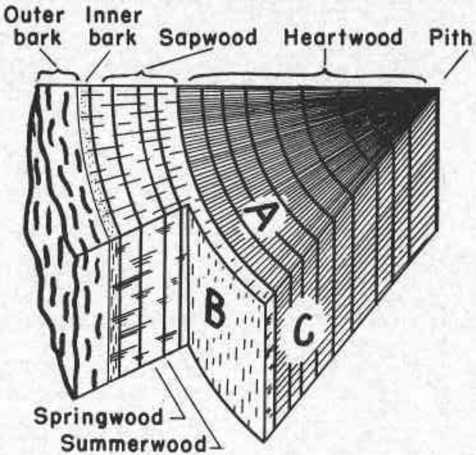


B. Tangential section showing uniseriate wood rays interspersed among thick walled wood fibers and thin-walled parenchyma.

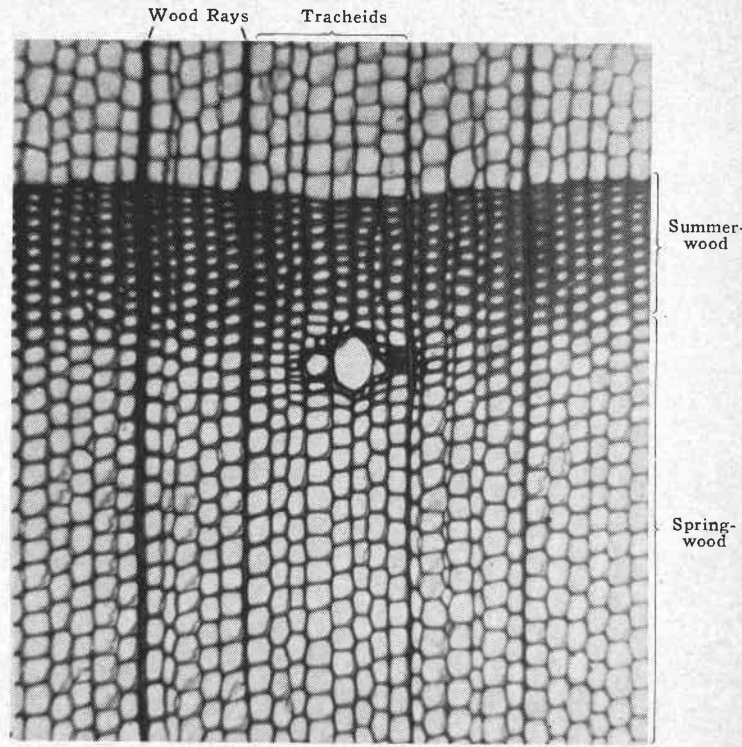


C. Radial section showing large wood ray in center and three smaller rays extending through summerwood into springwood containing vessels. Vertical strands of parenchyma are interspersed among the wood fibers.

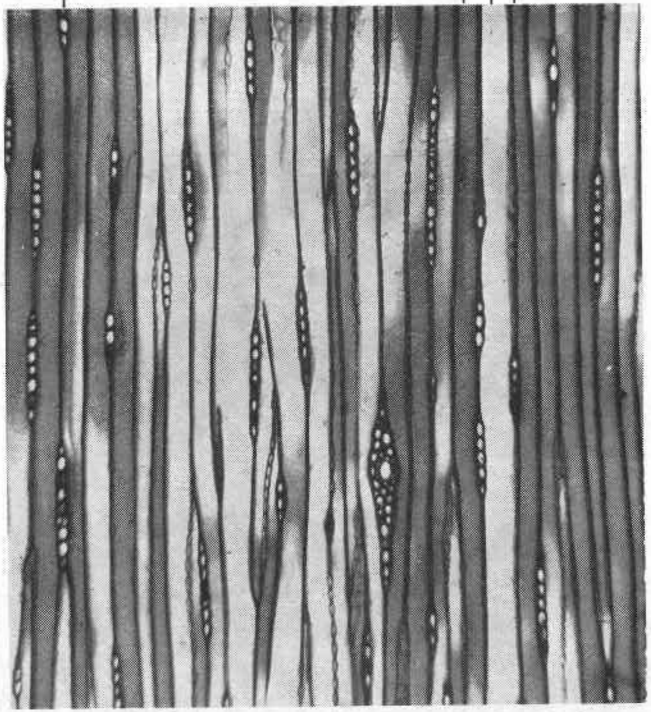
Figure 1. Gross Features and Anatomical Structure of White Oak
(Photographs—100X)



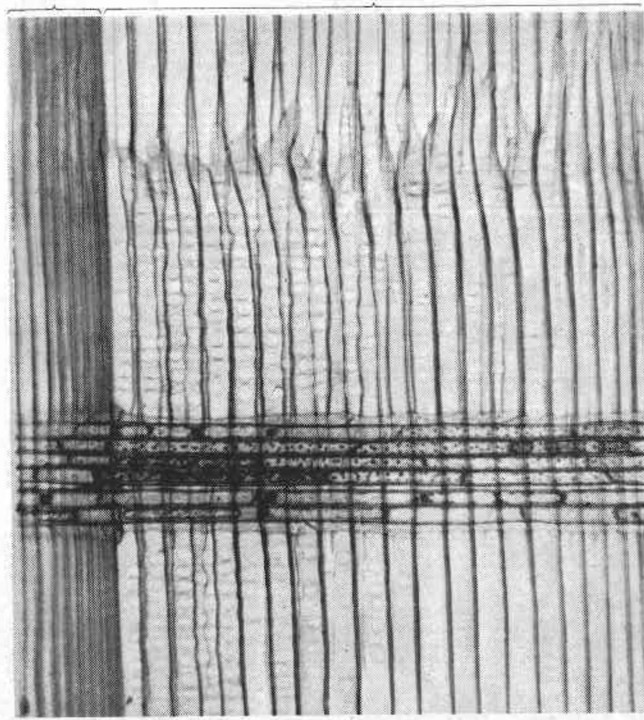
Sketch showing the relative positions of the wood sections from which the photographs were taken. A—Cross Section. B—Tangential Section. C—Radial Section.



A. Cross section showing resin ducts in an annual ring, gradual increase in the thickness of the tracheids within the annual ring, and the thin walled tracheids of the next year's growth.



B. Tangential section showing uniseriate wood rays and one fusiform wood ray containing a horizontal resin duct interspersed among the tracheids. The fine lines are spiral thickenings on the walls of the tracheids.



C. Radial section showing a wood ray extending through summerwood into the springwood. The numerous circles are bordered pits in the walls of the tracheids.

Figure 2. Gross Features and Anatomical Structure of Douglas-fir
(Photographs—100X)

Table 1. SOAKING PERIODS TO BE USED AS A GUIDE FOR TREATING THE SAPWOOD OF INCISED, SEASONED POSTS WITH A PRESERVATIVE-DIESEL OIL SOLUTION

Species	Soaking period		Longitudinal penetration in sapwood after a 24-hour soak*
	Butt	Top	
	Hours	*Hours*	*Inches*
Alder, red	6–24	2–6	16–22
Aspen†	6–24	2–6	....
Cedar, western red†	24–48	8–24	....
Cottonwood, black	6–24	2–6	18–30
Douglas-fir	48–144	24–48	1–8
Fir, white†	48–96	24–48	....
Larch, western†	48–96	24–48	....
Maple, bigleaf	6–24	2–6	22–37
Oak, Oregon white	48–144	24–48	1–5
Pine, lodgepole†	6–72	2–6	....

* Immersion depth 26 to 30 inches.

† Based in part on the publication *Cold-Soak Wood Preservation* by Ernest Wohletz and Vernon Ravenscroft, published by the School of Forestry, University of Idaho, Moscow, Idaho.

Glaze, strips of bark, and other surface conditions may interfere seriously with radial penetration, producing a thin irregularly-treated shell of wood. The exposure of end grain by incising helps to eliminate the effects of these surface conditions by permitting end penetration, which increases preservative retention and reduces the treating time required to obtain a uniformly deep treatment.

The distribution of a preservative-diesel oil solution from the butt and from an incision at the ground line is shown in Figure 3. The futility of painting posts with preservatives is illustrated in Figure 4, where it can be seen that virtually no radial penetration, very little end penetration, and no adequate retention can be obtained by this method of applying preservatives.

Treatability and durability of heartwood and sapwood

The formation of heartwood in most trees is characterized by a darkening in color and the presence of extractives, some of which may inhibit development of wood-destroying organisms, but which may also interfere seriously with the penetration of the preservative. The sapwood, though naturally less durable, is generally easier to treat. For this reason, the soaking and other nonpressure methods

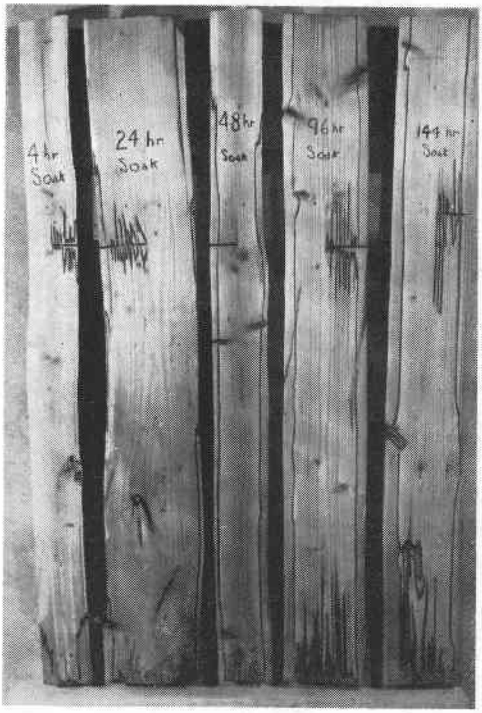


Figure 3. Penetration of Preservative in Douglas-fir

Douglas-fir post sections were seasoned to 12 per cent moisture content, cut half way through at 24 inches from the butt end, and soaked for different periods of time. Penetrations are indicated by black lines.

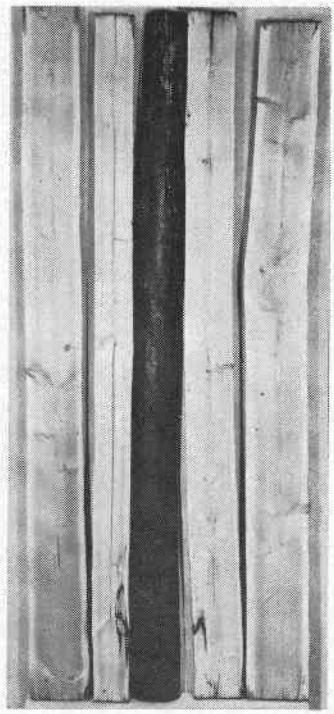


Figure 4. Douglas-fir Posts Painted with Wood Preservatives

The posts were given two heavy coats of the preservatives. Each coat was applied on a different hot summer day. Virtually no penetration was obtained and no increase in service life can be expected.

are limited to the treatment of the sapwood. Round posts of all species should be treated. Split posts containing durable heartwood and appreciable amounts of sapwood also should be treated, though little or no increase in the service life of the heartwood can be expected from the treatment. Thick sapwood permits deeper penetration and higher retentions of the preservative solution.

The relative durabilities of a number of Oregon woods are listed in the Appendix. These values represent maximum rather than typical serviceability, for the posts from which these test data were collected are not subject to the nailing, groundline erosion, and physical forces that frequently reduce the service life of posts actually in use. For example, several untreated cedar series in the test indicate a service life in excess of 20 years; in actual use, the service life of cedar posts is about 12 years.

Moisture content

Wood treats much more readily at a moisture content of less than 20 per cent when oil-soluble preservatives are used. Low moisture content also prevents reduction of the concentration of the preservative in the wood when water soluble preservatives are employed. The moisture content of freshly-cut sapwood is very high, frequently exceeding 150 per cent (oven-dry basis), but it can be reduced to 16 per cent or less in a few summer months when proper seasoning practices are employed. Posts at a moisture content suitable for treating will have numerous checks, will be lighter in weight, and will feel dry to the touch.

Seasoning conditions

Weather and the length of the seasoning period have a marked effect on surface conditions, seasoning checks, and drying rate of posts. Overwintering has been suggested for the elimination of glaze on lodgepole pine, but precautions must be taken to prevent attack by wood-destroying organisms. The advantages to be gained from long seasoning periods are not fully established. In general, it appears that the best results will be obtained if the posts are peeled, seasoned, and treated in the same year.

Treating conditions

Dry, warm, or hot weather favors penetration of the preservative by maintaining the treating solution at a minimum viscosity and by insuring that the surface of the material to be treated is relatively free of moisture.

Penetration improves as the viscosity of the solution decreases, but lower viscosity oils evaporate more rapidly and are usually more inflammable and more expensive. The lower viscosity diesel oils are satisfactory for treating most species, but it should be possible to use higher viscosity oils for treating incised posts of species that are easy to treat. In any case, the preservative must be sufficiently soluble in the oil to secure the required preservative concentration.

The practice of adding water to raise the level of the preservative-oil solution above the butt ends of the posts to reduce retention is not recommended. It serves no useful purpose in treating posts of thin sapwood species or species that are difficult to treat. In posts of easily treated species, longitudinal penetration of the water may be so rapid as to interfere seriously with the radial penetration of the preservative in the ground-line zone, and the increased weight of the post will give an erroneous indication of the amount of preservative retained.

PREPARATION OF POSTS FOR TREATMENT

The success attained by the soaking method and the serviceability of the treated product will be determined largely by the manner in which the posts are prepared for treatment. Every effort should be made to prepare the posts so that it will not be necessary to cut them after they are treated.

Cutting and peeling

Posts cut in the spring and early summer will peel more readily and season enough to be ready for treatment in late summer or early fall. They should be peeled, the butts of posts to be driven should be pointed, the tops should be sloped, and they should be incised and piled for seasoning immediately after cutting in order to promote drying and to discourage attack by wood-destroying organisms.

Peeling may be done with an axe, a flat-bladed shovel, a barking spud, a drawknife, or an old shovel worn to a "V." Incised posts need not be peeled clean, though strips of bark that might interfere with seasoning or with the depth of the incisions should be removed.

Incising

The incisions may be distributed uniformly over the surface of the post, or they may be made in rings of staggered incisions. Particular attention should be paid to incising the ground-line zone to insure a uniformly deep penetration in this critical area.

The incisions may be made with an axe blade (Frontispiece), saw, incising hammer, or with incising blades mounted on the head of an axe. The last two incising devices and their respective incising patterns are shown in Figure 5. The incisions should be staggered to minimize reduction in the strength of the post. Although some of the incisions may seem severe, after a few years of service the loss in strength will be much less than that caused by wood-destroying organisms in untreated posts.

The distance between incisions will depend on the species being treated and on the soaking time to be employed. Table 1 can be used as a guide in estimating this distance. For example, the incisions in alder, cottonwood, and maple may be from 8 to 12 inches apart for a

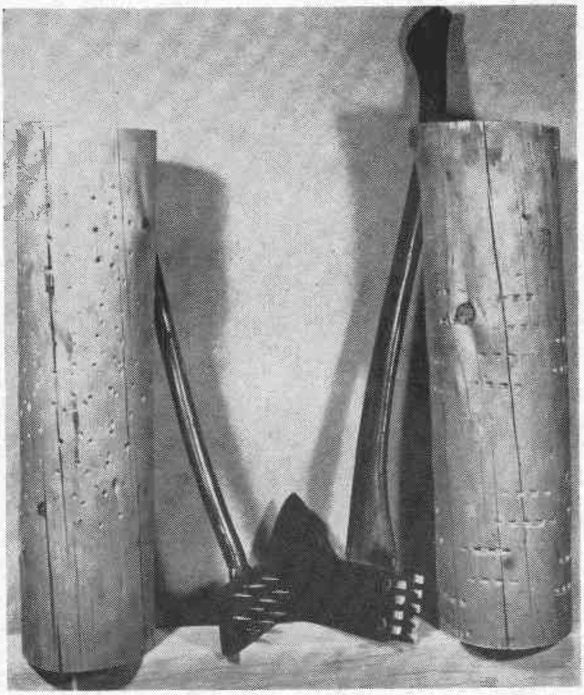


Figure 5. Devices for Incising Wood

A multi-pointed incising hammer and incising blades attached to the head of an axe. The points and blades should be made of heat-treated tool steel for long service.

24-hour soaking period, while the incisions in Douglas-fir should be not more than 6 inches apart for a 96-hour soaking period. A large number of small incisions will facilitate a higher preservative retention than a small number of large incisions.

Seasoning

Seasoning reduces the moisture content of the wood, and the resultant shrinkage causes the wood to split and check. Moderate checking is desirable, for this permits treatment of wood that otherwise would be exposed if unchecked treated posts were to continue to season after their installation.

The posts should be cross-piled on stone or sound wood supports at least 18 inches above ground to provide good circulation under and throughout the seasoning pile. Grass, brush, or weeds should be cleared from under and around the seasoning pile, for they will interfere with circulation and may promote conditions favorable to wood-destroying organisms.

Under normal summer conditions, posts from 4 to 6 inches in diameter can be seasoned in 1 to 3 months, but the seasoning period will vary with the size of the posts and with local climatic conditions. The rate of seasoning can be controlled to some extent by varying the spacing between individual posts and between layers of posts in the pile. In dry hot climates where the rate of seasoning is very rapid, the posts may be placed closer together, and the seasoning piles should be located out of the direct rays of the sun to reduce the rate of seasoning and thus prevent the development of large splits or checks.

THE SOAKING METHOD

This method consists of soaking the material in a preservative solution for a sufficient length of time to obtain the required penetration of the solution. Penetration can be controlled to a large extent by incising the posts to the desired depth and by soaking them for a sufficient length of time to treat completely the wood between the incisions.

Posts can be treated in either a horizontal or a vertical position. Large timbers can best be treated in the horizontal position, and the treating tanks should be equipped with devices for keeping the timbers submerged. Posts treated in a horizontal position will receive a uniform treatment while those treated on end will receive a heavier treatment of the butt because of the hydrostatic pressure of the treating solution.

Posts can also be treated by standing them on end in tanks slightly deeper than one-half the length of the posts and then reversing the ends. This method will permit some control of preservative retention in the butts and the tops of the posts.

Equipment

Oil-tight tanks or drums with covers are the only equipment required, though more elaborate equipment can be used for permanent of semipermanent installations. Ordinary 55-gallon drums are excellent if the posts are to be treated by the reversing-end method. Each drum will hold about 13 posts from 4 to 6 inches in diameter and will require about 20 gallons of treating solution to raise the liquid level to 30 inches. The drums are 22 inches in diameter and 34 inches deep.

For treating posts up to 8 feet in length by the reversing-end method, two tanks can be made from three drums by cutting one drum in half and welding one half to each of the other drums.

Preservatives

Either oil-soluble or water-soluble preservatives can be used, but the former are generally the more permanent. Coal-tar creosote is an excellent preservative, but its high viscosity at normal temperatures has prevented its use with the soaking method. Coal-tar creosote-petroleum solutions and low-viscosity oil-gas tar creosote may prove satisfactory with this method.

At present the two most promising oil-soluble preservatives for the soaking method are pentachlorophenol and copper naphthenate. Both are sold in concentrated solutions and in ready-to-use solutions. The concentrated solutions are easy to store, are readily diluted with oil according to specified directions and, when so diluted, are much cheaper than ready-to-use solutions. The manufacturer's directions should be followed implicitly, for overdilution will reduce the effectiveness of the treatment and underdilution will increase the cost of the treatment. A partial list of manufacturers and distributors of these two wood preservatives is given in the Appendix.

A solution containing 5 per cent by weight of pentachlorophenol or a solution of copper naphthenate containing 1 per cent of copper by weight is generally recommended for wood in contact with the ground. Stove oil and the lighter diesel oils are excellent diluents because of their low viscosities at normal temperatures. Stove oil is more volatile than diesel oil, and both are inflammable.

Copper naphthenate is green in color, and the depth of treatment is readily apparent on split surfaces of the wood. Pentachlorophenol is only slightly visible, but dyes can be added to color the solution. A red dye* has been found to color the wood satisfactorily when added in the proportions of $1\frac{1}{2}$ grams (about 1 teaspoonful) to each gallon of treating solution. Any dye that forms a true solution and colors the wood distinctly is satisfactory.

Precautions recommended by the manufacturer should be observed when handling wood preservatives. Their general recommendations are to avoid contact with the skin and prolonged breathing of the vapors. Washing with soap and water within a reasonable length of time after handling treated posts has been found to be an effective precautionary measure. Individuals who develop skin irritations should wear oil-resistant gloves and aprons.

* Sudan Red BBA Dye, R 5586, General Dyestuff Corporation, San Francisco, California; cost about $1.80 per pound.

Control of treatment

The amount of preservative retained by the posts can be measured by weighing the posts before and after treatment or by noting the amount of preservative that must be added to the treating tank to maintain the line of the preservative at a given height. Retention, however, is not necessarily an indication of the effectiveness of the treatment; good distribution of the preservative is even more important.

Distribution of the preservative can be determined by increment borings, by drilling holes in the posts with a brace and bit and noticing the depth at which untreated wood is encountered, or by actually splitting test posts. If either of the first two methods is used, the holes should be plugged with treated pegs or dowels.

The third method, even though it necessitates the destruction of a few posts, gives a true picture of the distribution of the preservative in the post. The posts or post sections that are to be cut should be typical of the charge and should be comparatively free of large knots, scars, or cuts that expose end grain; such features could produce an erroneous indication of the average treatment. The entire post may be split, or the post may be crosscut into sections that may then be split with the grain. The split faces should be examined immediately, for the oil creeps over the cut surfaces, giving a false indication of the depth and uniformity of treatment.

Treating standards

Since the ground-line zone and the ends of the posts are the critical post sections from the standpoint of initial attack by wood-destroying organisms, the protection of these sections is of primary importance.

The sapwood of the ground-line section should be treated uniformly to a depth of three-fourths of an inch. If the sapwood thickness is less than three-fourths of an inch, it should be completely treated. The importance of securing a uniform treatment, as illustrated in the Frontispiece, cannot be overemphasized.

The sapwood at each end of the post should be completely treated for several inches and the heartwood should have some penetration. Since it is difficult to treat the heartwood of many species by the soaking method, the tops of the posts should be sloped before treatment. Sloping the tops of all species, including the durable heartwood species, is an excellent practice, for it greatly reduces the period of time in which favorable decay conditions may exist in this post section.

The treatment should attempt to provide a retention of 6 pounds of preservative for each cubic foot of wood. It may be impossible to obtain this retention with some species, but longer soaking periods will assist in approaching it.

Cost of treating solution

The cost of the treating solution may vary from about $1.20 per gallon for ready-to-use solutions to $0.45 per gallon for the concentrate form diluted with diesel oil. The following formula may be used for computing the cost of the treating solution:

$$\frac{\text{Cost of one gallon or one pound of concentrate} + \text{Cost of oil added to dilute the concentrate}}{\text{Gallons or pounds of treating solution}} = \text{Cost of treating solution per gallon or pound}$$

For example, the cost of 1 gallon of a 1 to 10 treating solution made from pentachlorophenol concentrate at $3.50 per gallon and diesel oil at $0.14 per gallon would be as follows:

$$\frac{\$3.50 + (10 \times \$0.14)}{11} = \$0.45 \text{ per gallon (or } \$0.065 \text{ per pound)}$$

The cost of preservative for treating posts of various sizes to a retention of 6 pounds per cubic foot is shown in Table 2.

Table 2. ESTIMATED COSTS FOR TREATING POSTS OF VARIOUS SIZES

Post diameter	Approximate cost per linear foot	Cost for treating 30 inches of butt
Inches		
4	3.4¢	8.5¢
6	7.6	19.0
8	13.6	34.0
12	30.6	76.5

Since the highest retention that can be obtained for a number of species shown in Table 1 will be about three pounds per cubic foot, the cost of treatment will be greatly reduced for these species. Considerable care should be exercised to avoid overtreatment and the resulting high costs when treating species that will take high retentions. Both overtreatment and undertreatment can be avoided through incising which, in many ways, is the key to the successful preservative treatment of wood.

HANDLING PRESERVATIVE-TREATED POSTS

The value of a preservative treatment may be greatly reduced through improper handling practices or other abuses which expose untreated wood. Common abuses of treated posts include handling the posts with pointed instruments, cutting or boring through the treated layer, and burning. Sharpening the ends of posts or framing should, if possible, be done before the posts are treated. If the post must be cut after treatment, the exposed area should be swabbed heavily with the preservative solution. Cutting the treated wood at or below the ground line should be avoided.

ADVANTAGES OF PRESERVATIVE-TREATED POSTS

The following advantages of treated posts should be considered when comparing the costs of treated and untreated posts.

1. Service life should be 15 years or longer; 30 years is not exceptional for pressure-treated posts.
2. Maintenance costs are reduced because of long service life and the elimination of early failures.
3. Smaller posts may be used to reduce initial, installation, and maintenance costs.
4. Appearance of property is improved.
5. Posts may be re-used with much less danger of breakage.
6. Farm woodland timber can be utilized to better advantage because species of low natural durability may be used successfully when treated.

APPENDIX

THE ACTUAL OR ESTIMATED SERVICE LIFE OF UNTREATED POSTS THAT HAVE BEEN OR ARE BEING TESTED IN THE T. J. STARKER POST FARM*

Average Service Life of at Least 20 Years

Cedar, Alaska yellow	split
Cedar, Port Orford white	split
Cedar, western red	split
Juniper, Sierra	round and split
Locust, black	round and split
Osage, orange	round and split
Redwood	sawed
Yew, Pacific	round

Average Service Life of 10 to 15 Years

Cedar, California incense	split
Oak, Oregon white	split

Average Service Life of Less than 10 Years

Alder, red	split	5.2 years
Ash, Oregon	split	6.2 years
Cascara	round	5.4 years
Cottonwood, black	split	4.8 years
Douglas-fir	round and sawed	4.0–7.0 years
Fir, grand	split	8.7 years
Hemlock, western	sawed	5.8 years
Larch, western	sawed	6.0+ years

* The T. J. Starker Post Farm was established by the School of Forestry, Oregon State College, in 1927 to determine the durability of native woods and the effectiveness of various preservative treatments. It is now under the supervision of the Oregon Forest Products Laboratory in cooperation with the School of Forestry. Annual progress reports on the Post Farm are available, free of charge.

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2. Blew, J. O. Wood Preservatives. U. S. Forest Products Laboratory, Report R149, Revised April 1944.
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6. Wirka, R. M. Preservation of Timber by the Steeping Process. U. S. Forest Products Laboratory, Report R621, Revised Dec. 1945.

* With the exception of reference 4, all publications may be obtained free of charge by writing to the Director, U. S. Forest Products Laboratory, Madison 5, Wisconsin.

A PARTIAL LIST OF MANUFACTURERS AND DISTRIBUTORS OF COPPER NAPHTHENATE AND PENTACHLOROPHENOL

Manufacturer	*Trade Name*	*Distributor or Source of Information*
Copper Naphthenate		
General Petroleum Corp. 1029 S. W. Alder Street Portland 5, Oregon	Copper Naphthenate	General Petroleum Corp. 1029 S. W. Alder St. Portland 5, Oregon
Nuodex Products Co., Inc. Elizabeth F, New Jersey	Nuodex Copper	Fred E. Alsop Company 935 N. W. 12th Avenue Portland 9, Oregon
Oronite Chemical Company 38 Sansome Street San Francisco 4, California	Oronite Copper Naphthenate	Van Waters & Rogers, Inc. 3950 N. W. Yeon Avenue Portland 10, Oregon
Wood Treating Chemicals Co. 5137 Southwest Avenue St. Louis 10, Missouri	Coppertreat	Wood Treating Chemicals Co. 3207 S. E. 118th Avenue Portland 66, Oregon
Pentachlorophenol		
Chapman Chemical Company Terminal Sales Building Portland 5, Oregon	Penta Preservative	Chapman Chemical Co. Terminal Sales Building Portland 5, Oregon L. H. Butcher Company 1504 N. W. Johnson St. Portland 9, Oregon
Dow Chemical Company Midland, Michigan	Dow Wood Preservative	Dow Chemical Company Textile Tower Seattle 1, Washington Van Waters & Rogers, Inc. 3950 N. W. Yeon Avenue Portland 10, Oregon
Miller Products Company Ft. of S. W. Caruthers Portland 1, Oregon	Miller's Penta	Miller Products Company Ft. of S. W. Caruthers Portland 1, Oregon
Monsanto Chemical Co. St. Louis 4, Missouri	Santophen 20 Lauxtol A	Monsanto Chemical Co. 421 S. W. 6th Avenue Portland 4, Oregon
Pacific Supply Cooperative 1928 N. W. Vaughn Street Portland 8, Oregon	Wood Preservative	Pacific Supply Cooperative 1928 N. W. Vaughn Street Portland 8, Oregon
Protection Products Mfg. Co. Kalamazoo, Michigan	Woodlife Woodhealth	Chas. E. Sand Plywood Co. 1106 N. W. 16th Avenue Portland 9, Oregon
Wood Treating Chemicals Co. 5137 Southwest Avenue St. Louis 10, Missouri	Timbertox Woodtox	Wood Treating Chemicals Co. 3207 S. E. 118th Avenue Portland 66, Oregon