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Service Life of Treated and Untreated Fence Posts

1951 Progress Report on the T. J. Starker Post Farm

(Project No. 29)

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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A Research Project of the Oregon Forest Products Laboratory
Corvallis, Oregon

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TABLES

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Summary of 1951 Inspection

A total of 31 posts in 9 untreated, 7 nonpressure-treated and 1 pressure-treated series failed to withstand the customary 50-pound horizontal pull. Only three failures occurred above the ground line. The first failures in untreated black cottonwood (Series 82) and in nonpressure-treated Douglas-fir (Series 5 and 89) appeared. The remaining two untreated western larch posts (series 37) failed; bringing the average service life of this series to 7.3 years. Causes of post failures were as follows:

Cause	*Number of failures* 1949-1950	1951
Fungi (decay)	31	20
Termites (damp-wood)	6	1
Fungi and termites	15	9
Fungi and insects other than termites	6	1

Carpenter ants have been responsible for several post failures. In other instances, ants apparently invaded posts which had been previously attacked by termites.

Two new series of untreated posts, Series 76 (tanoak) and Series 84 (Arizona cypress), have been installed.

The T. J. Starker Post Farm

In 1927 the School of Forestry at Oregon State College established and has since maintained a "post farm" to obtain data on the natural durability of native woods and the effectiveness of different preservative treatments for species used as fence-post material. The first posts were set on January 7, 1928, and since the inception of the program, 2,338 posts have been placed in the farm. Three introduced and 24 native species in the untreated condition and 7 Oregon woods that were given various preservative treatments have been or are being tested.

The T. J. Starker Post Farm is located on School of Forestry land in the Peavy Arboretum about seven miles north of Corvallis, Oregon, on the west side of Highway 99W. The test area, located on an excellently drained south slope, uniformly consists of Olympic silty clay loam soil. The slightly acid top 8 inches of the soil has a pH of 5.4, an organic matter content of 4.71 per cent, a humus of ½ inch or less in thickness, and a nitrogen content of 0.1415 per cent.

Climatic conditions

The average annual rainfall in the Corvallis area since 1927 has been 35.33 inches, with an average of 129 rainy days per year. Some summer intervals have approached drought conditions. A mean relative humidity of 64.4 per cent and an average temperature of 53.5° F. have prevailed. The temperature occasionally falls below freezing and occasionally exceeds 85° F. Cool afternoon breezes from the Pacific Ocean usually arise daily during the summer months. Table 1 gives climatological data for the Corvallis area for the years 1928 through 1950.

Test specimens

Test posts are usually installed in groups of 25; each group constitutes a test series. Posts in each series are placed 2 feet apart in a row running in a northerly direction up the test plot slope. Test series are spaced 3 feet apart, and all posts are set into the ground to a depth of 2 feet.

Prior to 1947, installed test posts varied from 4 to 7 feet in length and ranged from 3 to 70 square inches in ground-line cross-sectional area. Test posts are now standardized at a length of 5 feet, and cross-sectional areas of individual posts are limited to 16 ± 8 square inches at a distance of 2 feet from the butt ends. The average cross-sectional area, 2 feet from the butt ends of the posts in each series, must fall within the limits of 16 ± 2 square inches.

Post inspections

Annual inspections are made during the month of October. A 50-pound horizontal pull at a height of 2 feet above the ground is applied to each post to determine failure, and each post that fails to withstand this pull is examined to establish the point and cause of failure. A deterioration rating is made of the top and visible ground-line zone of each post.

Post farm records

Recorded data for each series of posts include the source and kind of material, sizes of individual posts, percentage of sapwood, processing prior to installation or preservative treatment, the preservative treatment given (if any), date of installation, dates of individual post failures, the condition of each post at each annual inspection period, and other pertinent facts.

Interpretation of Data

Posts and other wood products used in contact with the ground and exposed to the weather are subject to attack by insects and wood-destroying fungi. The most vulnerable section of a fence post extends from a short distance above to some distance below the ground surface. This post zone usually has a more sustained favorable supply of the moisture and air necessary to the existence of these destructive agents. In areas of abundant rainfall or prolonged periods of high humidity, the tops of fence posts are subject to the same deterioration, but it normally proceeds at a slower rate. The ground-line section of a post is also important because preservatives are most subject to leaching action there and, on windy sites, sand erosion often cuts deeply into the wood of this zone. To evaluate intelligently the results of any test of fence post serviceability, many factors must be considered simultaneously.

Limitations of test data

The detailed tabular data presented at the end of this report cannot be applied indiscriminately to every locality and to all fence post service requirements. The data are primarily comparative and applicable to one area and one type of use; these data must be adjusted empirically to fit other situations.

Posts tested in the T. J. Starker Post Farm are not subject to the stapling, nailing, ground-line erosion, and physical forces that frequently reduce the service life of posts actually in use; but, on the other hand, these test posts are placed in climatic conditions that are conducive to virtually continuous insect attack and decay. The application of the arbitrary 50-pound horizontal pull to determine post failure is admittedly not comparable to the physical forces that may be suffered by fence posts in actual service.

Influence of climatic conditions

Climate determines to a great extent the proportion of time that suitable conditions for decay exist in a given region. Optimum temperatures for the growth of decay-producing fungi range from 60° to 80° F., but some fungi can develop at a temperature as low as 35° F. or as high as 120° F. If all parts of a wood post have a moisture content of 20 per cent or less (oven-dry basis) there is virtually no possibility of fungus growth. During long periods of extremely dry weather and in periods when the temperature approaches freezing, the rate of decay in posts is retarded. The rate of post decay is doubtless much slower in regions where long periods of unfavorable moisture or temperature conditions prevail. In western Oregon, for example, where moisture and temperature conditions are favorable for long periods, untreated tops of posts that have been given adequate butt treatment with a good preservative often decay long before the ground-line sections are seriously weakened.

Consideration of post characteristics

Post service records in this report mean little if the characteristics of the wood are not taken into consideration. The size, amount of sapwood, and extractive constituents in the wood greatly influence the serviceability of untreated posts. Larger posts may give longer service, not only because of greater gross volume of wood, but also because of the higher proportion of heartwood that they usually contain. The sapwood of no native species is naturally insect- and decay-resistant. Extractive constituents in the heartwoods of a few species promote resistance to insect and fungus attack; with some exceptions, these extractives give heartwood a darker color than that of sapwood.

Equal importance of preservatives and methods of preservation

The service life of treated wood is affected by the nature of the preservative used, the portion of the product treated, the amount of preservative retained by the wood, the method of treatment, and the uniformity of treatment. Most preservatives are effective fungicides and insecticides, but extension of the service life of wood requires the continued presence of the preservative in a concentration that is toxic to the organisms responsible for deterioration. It is important that the preservative be present in the areas subject to attack, principally the ground-line zone and, in some instances, also the top of the post.

The method of treatment and the preservative used are equally important, for poor treatment produces poor results. For this reason, a preservative cannot be condemned until it can be shown that the treatment was unsatisfactory despite application of the preservative by a proper treating method. Although a preservative may fail under one set of climatic conditions, it may prove extremely successful under different conditions. A preservative that is very soluble in water, for example, may leach from wood in a region of abundant rainfall, whereas in a dry climate it may be permanent. Successful treatment provides uniform penetration into the treated area and the retention of a sufficient quantity of preservative within the wood structure adequately to protect the wood under the conditions in which it is to be used. High total retention of preservatives is not necessarily an indication of successful treatment; in some species the end penetration of the preservative may be very rapid, whereas side penetration may be very slow. This may result in complete protection of the end of the post, with virtually no protection of the groundline zone.

Preliminary Evaluation of Tests

Determination of the service life of a series in which most or all posts have failed is relatively simple; for many of the naturally decay-resistant untreated series and for treated series in which few posts have failed, estimation of average service life cannot be made with accuracy. The estimated service life, when given for any series in this report, is based on the number of posts that have failed and on the service age and condition of the remaining posts. For a few untreated species, the natural decay resistance as determined in other service tests has been taken into consideration in making estimates of service life.

Untreated fence posts

The characteristics, service records, and removal records of untreated fence posts are shown in Tables 2, 3, and 8. Based on the actual and estimated service life for each untreated series of posts, the various species tested or being tested are classified into three broad groups. Numerals in parentheses indicate series numbers for convenience in referring to tabular data.

1. *Average service life of at least 20 years*
    - a. Cedar, Alaska yellow (46)
    - b. Cedar, Port Orford white (21)
    - c. Cedar, western red (10, 11)
    - d. Juniper, Sierra (30)
    - e. Locust, black (40)
    - f. Osage-orange (32)
    - g. Redwood (58)
    - h. Yew, Pacific (13)

2. *Average service life of 10 to 15 years*
    - a. Cedar, California incense (29)
    - b. Oak, Oregon white (19)

3. *Average service life of less than 10 years*
    - a. Alder, red (16)
    - b. Ash, Oregon (28)
    - c. Cascara (20, 47)
    - d. Cottonwood, black (14, 82)

e. Douglas-fir (1, 55, 57, 72)
f. Fir, grand (15)
g. Hemlock, western (38)
h. Larch, western (37)
i. Madrone, Pacific (26)
j. Maple, bigleaf (17)
k. Pine, lodgepole (48, 49)
l. Pine, ponderosa (36)
m. Pine, sugar (35)
n. Pine, western white (34)
o. Spruce, Sitka (31)

Initial failures of untreated posts of species showing an average service life of less than 10 years usually occurred at the end of the first 2 or 3 years of service. If such posts must be used, one should expect to replace a few posts after this relatively short time interval, although the average service life of the entire lot may be several times greater than this.

Treated fence posts: nonpressure processes

The characteristics, service records, and removal records for fence posts treated by nonpressure preservation processes are given in Tables 4, 5, and 9. An attempt has been made to evaluate each treatment and, where a treatment has failed to produce a longer average service life than that of untreated material of the same species, the suspected cause of such failure is indicated. Nonpressure preservative treatments have been segregated into two groups on the basis of performance. The names and series numbers of the species receiving these treatments are indicated in parentheses.

1. Treatments that have not increased the average service life of posts.

a. BRUSH APPLICATION OF ASPHALT EMULSION (Douglas-fir, 39). Brush application of the most efficient preservative can hardly be considered an effective treatment for fence posts. The preservative cannot penetrate the wood sufficiently, and posts retain very little of the preservative.

b. CHARRING (Douglas-fir, 22). Charring is not a preservative treatment and, if it accomplishes anything, it tends to shorten the average service life of posts by producing seasoning checks that give spores of decay-producing fungi access to interior parts of the post and by reducing the volume of wood in the critical zone.

c. COLD SOAKING IN 5 PER CENT SOLUTION OF ZINC CHLORIDE (Douglas-fir, 12). These posts were not appreciably benefited by this treatment for two possible reasons: (a) inadequate treatment of the ground-line section and (b) leaching of the water-soluble preservative.

d. HOT AND COLD BATH IN CARBOLINEUM "B" (Port Orford white cedar, 9). This treatment seems to have had little effect in increasing the average service life of this species; the service record of untreated Port Orford white cedar is very similar to that of the treated material.

2. Treatments that have increased the average service life of posts.

a. A. C. M. Co. treater dust and paste (Douglas-fir, 5, 6, 24, 25).
b. Hot and cold bath using Carbolineum "B" (Douglas-fir, 8).
c. Hot and cold bath using creosote (black cottonwood, 27).
d. Hot and cold bath using 50 per cent creosote and 50 per cent crankcase oil (Douglas-fir, 18).
e. Hot and cold bath using Gasco creosote oil (Douglas-fir, 54).
f. Salt treatment (Douglas-fir, 2, 3, 4 and lodgepole pine, 50).
g. Soaking in Permatol "A" (ponderosa pine, 56).
h. Tire-tube method using Chemonite (Douglas-fir, 59).

Reference to the service records (Table 5) of posts in the latter of the two foregoing groups will reveal that many of these nonpressure treatments have been highly effective in protecting the groundline zone. Serious deterioration in the tops of such posts indicates that some form of top treatment also should be given.

Treated fence posts: pressure processes

The characteristics, service records, and removal records of fence posts treated by pressure processes are shown in Tables 6, 7, and 10. The service records of many pressure-treated series are comparatively short, but there is every reason to expect long service life from posts pressure-treated with the preservatives listed below.

The names and series numbers of species treated with these preservatives are indicated in parentheses.

1. Chemonite (Douglas-fir, 45, and western hemlock, 44).
2. Coal-tar creosote (Douglas-fir, 53).
3. Coal-tar creosote and petroleum mixture (Douglas-fir, 51).
4. Creosote (Douglas-fir, 23).
5. Creosote, 70 per cent and fuel oil, 30 per cent (Douglas-fir, 7).
6. Gasco creosote oil (Douglas-fir, 52).
7. Wolman (Tanalith) salts (Douglas-fir, 42, and western hemlock, 41).
8. Zinc-meta-arsenite (Douglas-fir, 33).

Although the service life of Douglas-fir (Series 43) has been increased by chromated zinc chloride treatment, seven post failures have occurred in the series, indicating that this preservative treatment has been less effective than those in the foregoing list.

Methods of Applying Preservatives to Test Posts

BRUSH TREATMENT: Preservatives and preservative solutions are applied to the wood surface with a brush. Brush treatment of fence posts cannot be recommended.

CHARRING: Although sometimes called a preservative treatment, charring the surface of wood cannot be justly designated a preservative treatment.

HOT AND COLD BATH: In this treatment, often called the open tank method, the posts are first soaked in a hot preservative solution for a number of hours; then the posts either are allowed to cool in the preservative or are transferred into a cool solution. Posts to be treated by this method should be peeled and thoroughly seasoned. One end, both ends, or the entire length of the post may be treated by this method.

OSMOPLASTIC BANDAGE: A 9-inch strip of the bark of a green post is removed at the ground line, and the peeled area is coated with a preservative mixture. A water-resistant covering is tightly wrapped around the coated area. The preservative mixture is also applied to the ends of the post.

OSMOSALTS: Osmosalts in a thick water solution are applied to the ends and to the peeled surfaces of green posts, which are then closely piled and covered for varying periods of time to allow the preservative mixture to diffuse into the wood.

PRESSURE TREATMENTS: Prior to treatment, posts are air seasoned, artificially seasoned in the preservative by boiling under vacuum, or conditioned by steaming. Hot preservative is injected into the wood under pressure in a closed container, and a final vacuum is usually applied to remove excess preservative and dry the surface of the wood. The full length of the post receives treatment.

SALT TREATMENT: A $\frac{3}{4}$-inch hole slanting toward the butt is drilled to a depth of about 2 inches just above the ground line of an unpeeled, freshly cut post. One tablespoonful of a dry mixture of equal proportions by weight of salt (sodium chloride) and corrosive sublimate (mercuric chloride) or one tablespoonful of a dry mixture of equal proportions by weight of salt, corrosive sublimate, and arsenous oxide is placed in the hole. A snugly fitting wood plug is then driven into the hole. The holes should be spaced not more than 5 inches apart around the circumference of each post and staggered vertically to prevent weakening the post seriously. **Corrosive sublimate and arsenous oxide are very poisonous chemicals that must be handled with extreme care.**

SOAKING TREATMENT: Posts are placed in the preservative solution to the desired depth and permitted to soak for a number of hours or days. The posts should be peeled and thoroughly seasoned. For many species, that portion of the post 6 inches above and 12 inches below the ground line should be incised to a depth of $\frac{1}{2}$ inch. This treatment has proved to be very successful for some species and much less effective for others. It is primarily a sapwood treatment.

TIRE-TUBE METHOD: One end of a portion of an automobile tire inner tube is slipped over the butt end of an unpeeled, freshly cut post that is laid with the butt end higher than the top end on an inclined rack. The open end of the tire tube is elevated, and the tube is filled with preservative. The preservative, after a period of time, diffuses through the sapwood and finally drips out of the lower end of the post.

Preservative Materials Used for Test Posts

ASPHALT EMULSION: An emulsion or suspension of finely dispersed particles of asphalt in water. Asphalt is a black to dark brown solid or semisolid material composed predominantly of bitumens.

CARBOLINEUM: Carbolineums, or anthracene oils, are coal-tar distillates of higher specific gravity and higher boiling range than ordinary coal-tar creosote. The exact composition of Carbolineum "B" is not known.

CHEMONITE: Chemonite solution consists of copper, arsenic, and ammonium acetate dissolved in ammoniacal solution. A retention of 0.3 pound of dry preservative salt per cubic foot of wood is specified for pressure treatments.

CHROMATED ZINC CHLORIDE: The preservative contains about 82 per cent zinc chloride and 18 per cent sodium bichromate; it is injected in water solution. A retention of about 0.75 pound of dry chemicals per cubic foot of wood is specified for pressure treatments.

COPPER NAPHTHENATE: The oil-soluble copper salt of naphthenic acid. Solutions containing 1 per cent copper by weight have been recommended for optimum performance.

CREOSOTE, CREOSOTE OIL, OR COAL-TAR CREOSOTE: A distillate of coal tar produced by high temperature carbonization of bituminous coal. It consists principally of liquid and solid aromatic hydrocarbons, contains appreciable quantities of tar acids and tar bases, and has a continuous boiling point range that begins at about 200° C. and extends to a temperature at least 125° C. higher.

CREOSOTE MIXTURES: Creosote may be mixed in varying proportions with petroleum, crankcase oil, or other diluents that act as carriers for the creosote.

GASCO CREOSOTE: A distillate of tar residue resulting from the cracking of asphaltic-base petroleum oils in which artificial fuel gas is the main product. It is manufactured by the Portland Gas and Coke Company, Portland, Oregon.

OSMOSALTS: A proprietary wood preservative containing sodium fluoride, sodium bichromate, dinitrophenol, and sometimes arsenic. The chemicals are water-soluble.

PENTACHLOROPHENOL: An oil-soluble chemical compound formed from phenol and chlorine. Solutions containing 5 per cent pentachlorophenol by weight are recommended for wood in contact with soil.

PERMATOL "A": A preservative containing pentachlorophenol as its toxic constituent. The name, Permatol, has been copyrighted by the Western Pine Association.

SALT AND CORROSIVE SUBLIMATE: A mixture of equal proportions by weight of the two water-soluble chemicals. Corrosive sublimate (mercuric chloride) is the toxic chemical, and the salt serves to hold moisture. **Corrosive sublimate is an extremely poisonous chemical.**

SALT, CORROSIVE SUBLIMATE, AND ARSENOUS OXIDE: A mixture of equal proportions by weight of the three chemicals. The arsenous oxide is an additional water-soluble toxic agent. The addition of this chemical apparently contributes little, if anything, to the effectiveness of the corrosive sublimate. **Corrosive sublimate and arsenous oxide are extremely poisonous chemicals.**

SODIUM PENTACHLOROPHENATE: The water-soluble sodium salt of pentachlorophenol.

SODIUM TRICHLOROPHENATE: The water-soluble sodium salt of trichlorophenol.

TREATER DUST, GRANULAR TREATER DUST, AND TREATER PASTE: Preservatives formerly produced by the Anaconda Copper Mining Company as byproducts of its copper smelting operation. Arsenic trioxide is the principal toxic constituent of the preservatives that were sold in dust, granular dust, and paste forms. The paste form was applied directly to the wood; the dust and granular forms were placed around the posts as earth was backfilled in the post-setting operation. The manufacture of these preservatives has been discontinued.

WOLMAN SALTS (TANALITH): A proprietary wood preservative normally containing sodium fluoride, dinitrophenol, sodium chromate, and sodium arsenate. It is injected in water solution.

ZINC CHLORIDE: A chemical applied to wood in a 2 to 5 per cent water solution.

ZINC-META-ARSENITE: A preservative prepared by dissolving zinc oxide and arsenic trioxide in water that has been acidified with acetic acid.

Table 1. CLIMATOLOGICAL DATA, CORVALLIS, OREGON*

Year	Mean temperature	Maximum temperature	Minimum temperature	Mean relative humidity	Total rainfall	Minimum monthly rainfall	Maximum monthly rainfall	Rainy days
	°F	*°F*	*°F*	*Per cent*	*Inches*	*Inches*	*Inches*	*Number*
1928	53.4	102	20	......	39.86	0.00	9.43	136
1929	52.7	97	16	70.5	24.45	Trace	11.44	98
1930	52.7	98	4	69.2	23.68	0.00	5.07	110
1931	54.4	104	24	68.5	39.13	0.00	9.12	131
1932	53.4	99	9	62.6	36.94	Trace	8.09	135
1933	52.3	96	11	64.3	42.59	0.00	14.15	145
1934	55.2	99	26	62.5	35.42	0.10	9.71	115
1935	52.6	106	15	63.0	26.35	0.10	4.76	105
1936	54.2	93	19	67.6	32.11	Trace	10.82	121
1937	53.6	98	10	66.8	58.06	0.08	11.17	157
1938	54.3	104	21	64.0	32.04	Trace	7.42	139
1939	54.9	104	25	65.6	26.33	0.22	8.53	113
1940	55.7	100	20	67.2	40.36	Trace	9.80	128
1941	55.0	104	26	64.7	32.95	0.00	7.99	131
1942	53.9	104	17	59.9	39.20	Trace	12.69	......
1943	53.1	95	11	58.2	31.53	0.02	5.60	100
1944	53.2	103	21	58.2	22.99	Trace	4.63	97
1945	53.4	98	20	64.4	37.79	0.08	10.08	133
1946	52.2	107	20	61.9	33.42	0.01	6.78	145
1947	53.7	95	18	64.0	33.91	0.16	9.05	141
1948	51.5	97	19	63.6	40.14	0.06	7.46	158
1949	52.5	95	12	61.2	34.84	Trace	11.84	135
1950	53.0	99	—1	68.1	48.58	0.21	12.17	171
Average	53.5	100	17	64.4	35.33	......	....	129

* Data from Agricultural Experiment Station, Oregon State College, Corvallis.

Table 2. CHARACTERISTICS OF UNTREATED FENCE POSTS

Species	Series number	Number of posts in test	Post description	Sapwood	Ground-line perimeter			Remarks
					Minimum	Maximum	Average	
				Per cent	*Inches*	*Inches*	*Inches*	
Alder, red	16	25	Split	25	15.0	24.0	19.6	
Ash	28	25	Split	30	14.4	24.0	19.2	
Cascara	20	12	Round, peeled	70	6.0	13.3	8.9	
Cascara	47	26	Round, unpeeled	35	12.6	30.2	17.3	
Cedar, Alaska yellow	46	24	Split, mostly heartwood	....	13.0	22.5	17.7	From tree down 4 years
Cedar, California incense	29	25	Split	0	15.6	26.4	20.4	
Cedar, Port Orford white	21	25	Split	0	17.0	32.0	24.4	
Cedar, western red	10*	25	Split	0	18.0	23.0	19.9	Selected for dark color
Cedar, western red	11*	25	Split	0	17.0	21.0	19.1	Selected for light color
Cottonwood, black	14	25	Split	20	17.0	28.0	22.4	
Cottonwood, black	82	25	Round, unpeeled	95	9.7	17.6	14.1	
Cypress, Arizona	84	25	Round, unpeeled	100	10.4	14.7	12.6	
Douglas-fir	1	25	Round, unpeeled	60	15.5	22.0	19.1	
Douglas-fir	55	25	Square	0	16.0	16.0	16.0	
Douglas-fir	57	25	Square	0	16.0	16.0	16.0	
Douglas-fir	72	25	Round, unpeeled	48	10.4	16.3	13.5	
Fir, grand	15	25	Split	65	17.5	28.0	22.4	
Hemlock, western	38	25	Square	0	16.0	16.0	16.0	
Juniper, Sierra	30	11	Round, peeled	40	19.0	26.5	22.1	
	30	14	Split	40	17.5	27.5	23.9	
Larch, western	37	25	Square	0	16.0	16.0	16.0	
Locust, black	40	8	Round	20	6.3	17.3	10.4	
	40	14	Split	20	11.3	27.0	15.8	
Madrone, Pacific	26	25	Round and split	40	16.5	27.5	21.2	
Maple, bigleaf	17	25	Split	25	17.5	24.5	20.4	
Metal	60	25	Angle iron, 1.1 lb. per foot	....	......	......	......	Aluminum paint
Metal	61	25	"T" post, 1.2 lb. per foot	....	......	......	......	Red oxide paint
Metal	69	9	H-beam, 4 lb. per foot	....	......	......	......	Green enamel, baked
Metal	70	10	Flanged channel, 1.3 lb. per foot	....	......	......	......	Green enamel, baked
Metal	71	10	"T" post, 1.5 lb. per foot	....	......	......	......	Green enamel, baked
Oak, Oregon white	19	24	Split	20	15.0	23.5	18.5	
Osage-orange	32	11	Round, unpeeled	10	15.8	26.0	20.1	
		15	Split	10	12.6	20.6	17.5	
Pine, lodgepole	48	26	Round, peeled	55	12.6	18.8	15.7	From dead trees
Pine, lodgepole	49	25	Round, peeled	55	12.6	18.8	15.7	From live trees
Pine, ponderosa	36	25	Square	0	16.0	16.0	16.0	
Pine, sugar	35	25	Square	0	16.0	16.0	16.0	
Pine, western white	34	25	Square	0	16.0	16.0	16.0	
Redwood	58	25	Square	0	16.0	16.0	16.0	
Spruce, Sitka	31	26	Square	0	16.0	16.0	16.0	
Tanoak	76	25	Round, unpeeled	100	9.1	15.4	12.2	
Yew, Pacific	13	23	Round, peeled	10	9.7	23.2	15.7	

* From same group of posts.

Table 3. SERVICE RECORDS OF UNTREATED FENCE POSTS

Species	Series number	Number of posts in test	Number of posts removed at last inspection	Number of posts remaining	Average service life of removed posts	Service age of remaining posts	Location and extent of deterioration in remaining posts: Ground-line zone: Little or none	Ground-line zone: Moderate to severe	Top: Little or none	Top: Moderate to severe
					Years	*Years*	*Number of posts*	*Number of posts*	*Number of posts*	*Number of posts*
Alder, red	16	25	....	0	5.2	......	....	....	....	....
Ash, Oregon	28	25	....	0	6.2	......	....	....	....	....
Cascara	20	12	....	0	5.4	......	....	....	....	....
Cascara	47	26	....	2	6.9	13.7	0	2	0	2
Cedar, Alaska yellow	46	24	....	22	11.9	13.9	8	14	20	2
Cedar, California incense	29	25	....	5	12.0	21.6	1	4	5	0
Cedar, Port Orford white	21	25	3	4	19.5	22.4	0	4	0	4
Cedar, western red	10	25	2	16	19.5	22.6	2	14	16	0
Cedar, western red	11	25	3	13	18.6	22.5	0	13	13	0
Cottonwood, black	14	25	....	0	4.8	......	....	....	....	....
Cottonwood, black	82	25	3	22	2.5	2.5	19	3	22	0
Cypress, Arizona	84	25	....	....	......	0	25	0	25	0
Douglas-fir	1	25	....	0	7.0	......	....	....	....	....
Douglas-fir	55	25	....	0	6.2	......	....	....	....	....
Douglas-fir	57	25	....	0	4.0	......	....	....	....	....
Douglas-fir	72	25	....	25	......	2.8	25	0	25	0
Fir, grand	15	25	....	0	8.7	......	....	....	....	....
Hemlock, western	38	25	....	0	5.8	......	....	....	....	....
Juniper, Sierra	30	25	1	17	18.1	21.7	....	17	4	13
Larch, western	37	25	2	0	7.3	......	....	....	....	....
Locust, black	40	22	1	20	15.5	16.5	6	14	20	0
Madrone, Pacific	26	25	....	0	5.8	......	....	....	....	....
Maple, bigleaf	17	25	....	0	6.5	......	....	....	....	....
Metal, Angle iron	60	25	....	25	......	2.9	25	0	25	0
Metal, T-post	61	25	....	25	......	2.9	25	0	25	0
Metal, H-beam	69	9	....	9	......	2.8	9	0	9	0
Metal, Channel	70	10	....	10	......	2.8	10	0	10	0
Metal, T-post	71	10	....	10	......	2.8	10	0	10	0
Oak, Oregon white	19	24	1	9	12.3	22.4	5	4	5	4
Osage-orange	32	26	....	26	......	18.5	21	5	26	0
Pine, lodgepole	48	26	....	0	5.1	......	....	....	....	....
Pine, lodgepole	49	25	....	0	4.0	......	....	....	....	....
Pine, ponderosa	36	25	....	0	6.4	......	....	....	....	....
Pine, sugar	35	25	....	0	7.3	......	....	....	....	....
Pine, western white	34	25	....	0	5.8	......	....	....	....	....
Redwood	58	25	1	23	10.8	11.7	23	0	22	1
Spruce, Sitka	31	26	....	0	5.7	......	....	....	....	....
Tanoak	76	25	....	....	......	0	25	0	25	0
Yew, Pacific	13	23	....	17	12.1	22.6	5	12	17	0

Table 4. CHARACTERISTICS OF TREATED FENCE POSTS
Nonpressure processes

Species	Series number	Post description	Sapwood	Ground-line perimeter: Minimum	Ground-line perimeter: Maximum	Ground-line perimeter: Average	Preservative treatments*	Average retention per cubic foot: Butt	Average retention per cubic foot: Top	Average retention per cubic foot: Post
			Per cent	*Inches*	*Inches*	*Inches*		*Pounds*	*Pounds*	*Pounds*
Cedar, Port Orford white	9	Round, peeled	25	18.0	21.5	19.5	Hot-cold bath, carbolineum "B," butt	......	......	......
Cottonwood, black	27	Split, peeled	20	16.5	24.5	21.6	Hot-cold bath, creosote, B-6	......	......	......
Cottonwood, black	68	Round, peeled, incised	89	11.0	17.3	13.5	Soak, 5 per cent pentachlorophenol-diesel oil, B-6, T-1	7.31	4.06	2.86
Cottonwood, black	74	Round, peeled, incised	99	11.0	16.0	13.5	Soak, 5 per cent sodium pentachlorophenate, B-4, T-1	7.66	4.47	2.93
Cottonwood, black	77	Round, peeled, incised	95	11.0	17.3	13.5	Soak, copper naphthenate-diesel oil (1 per cent copper), B-6, T-1	2.71	1.47	1.04
Cottonwood, black	78	Round, ground-line peeled, green	83	11.3	16.6	13.8	Osmoplastic bandage	......	......	......
Cottonwood, black	87	Round, peeled, incised	90	11.0	17.3	14.1	Soak, Gasco creosote oil, B-3, T-2	10.9	10.1	5.80
Douglas-fir	39	Round, peeled	60	15.5	22.0	19.1	Brush, asphalt emulsion, butt	......	......	......
Douglas-fir	79	Round, peeled	40	10.4	17.0	14.1	Brush, 2 coats, 5 per cent pentachlorophenol-diesel oil	......	......	......
Douglas-fir	80	Round, peeled	46	10.4	18.5	13.8	Brush, 2 coats, copper naphthenate-diesel oil	......	......	......
Douglas-fir	81	Round, peeled	44	11.3	17.9	14.8	Brush, 2 coats, coal-tar creosote	......	......	......
Douglas-fir	92	Round, peeled	46	9.4	18.2	14.1	Brush, 2 coats Avenarius carbolineum	......	......	......
Douglas-fir	22	Round, peeled	60	12.5	19.3	14.7	Charred ¼ inch deep, butt	......	......	......
Douglas-fir	2	Round, unpeeled, green	60	14.0	22.7	18.3	Salt and mercuric chloride, 1 hole, butt	......	......	......
Douglas-fir	91	Round, unpeeled, green	32	10.4	16.6	14.1	Salt and mercuric chloride (2:1), 1 hole, butt	......	......	......
Douglas-fir	3	Round, unpeeled, green	60	15.0	26.0	19.9	Salt, mercuric chloride, and arsenous oxide, 2 holes, butt	......	......	......
Douglas-fir	4	Round, unpeeled, green	60	15.0	22.0	17.5	Salt, mercuric chloride, and arsenous oxide, 3 holes, butt	......	......	......
Douglas-fir	89	Round, unpeeled, green	45	9.4	17.3	14.1	Sodium trichlorophenate, 3 holes, butt	......	......	......
Douglas-fir	90	Round, unpeeled, green	39	11.3	17.3	14.1	Sodium pentachlorophenate, 3 holes, butt	......	......	......
Douglas-fir	5	Round, unpeeled, green	60	13.0	20.5	15.6	A.C.M. Co. treater dust, butt	......	......	......
Douglas-fir	6	Round, unpeeled, green	60	13.0	20.5	16.5	A.C.M. Co. granulated treater dust, butt	......	......	......
Douglas-fir	24	Round, peeled, green	60	12.0	18.5	14.4	A.C.M. Co. treater paste, butt	......	......	2.00
Douglas-fir	25	Round, peeled, green	60	12.5	18.0	15.5	A.C.M. Co. treater paste, butt	......	......	4.00
Douglas-fir	59	Round, unpeeled, green	60	13.6	21.4	17.4	Tire-tube, full-length diffusion, Chemonite	......	......	6.00

* B (butt) and T (top) are followed by treating time in hours.

Table 4. CHARACTERISTICS OF TREATED FENCE POSTS (*Continued*)
Nonpressure processes

Species	Series number	Post description	Sap-wood	Ground-line perimeter: Mini-mum	Ground-line perimeter: Maxi-mum	Ground-line perimeter: Aver-age	Preservative treatments*	Average retention per cubic foot: Butt	Average retention per cubic foot: Top	Average retention per cubic foot: Post
			Per cent	*Inches*	*Inches*	*Inches*		*Pounds*	*Pounds*	*Pounds*
Douglas-fir	73	Round, ground-line peeled, green	58	11.0	16.6	14.1	Osmoplastic bandage	......	......	......
Douglas-fir	75	Round, peeled, green	46	11.0	17.3	14.1	Osmosalts, covered 30 days	......	......	......
Douglas-fir	12	Round, peeled	60	11.9	16.7	13.8	Soak, 5 per cent zinc chloride, B-192	......	......	......
Douglas-fir	62	Round, peeled, incised	33	11.3	16.0	13.8	Soak, 5 per cent pentachlorophenol-diesel oil, B-2, T-2	1.02	0.40	0.37
Douglas-fir	63	Round, peeled, incised	26	10.4	17.6	13.5	Soak, copper naphthenate-diesel oil (1 per cent copper), B-48, T-6	1.64	0.26	0.50
Douglas-fir	64	Round, peeled, incised	46	10.4	17.3	14.1	Soak, 5 per cent pentachlorophenol-diesel oil, B-48, T-6	2.22	0.45	0.95
Douglas-fir	65	Round, peeled, incised	40	11.0	16.3	14.1	Soak, copper naphthenate-diesel oil (1 per cent copper), B-2, T-2	0.75	0.30	0.29
Douglas-fir	66	Round, peeled	40	11.0	17.3	14.1	Soak, 5 per cent pentachlorophenol-diesel oil, B-48, T-6	1.03	0.23	0.35
Douglas-fir	67	Round, peeled	33	10.7	17.3	13.8	Soak, copper naphthenate-diesel oil (1 per cent copper), B-48, T-6	0.73	0.24	0.25
Douglas-fir	88	Round, butt peeled and incised	40	9.4	18.5	13.8	Soak, Gasco creosote oil, B-168, T-48	3.1	2.2	1.40
Douglas-fir	93	Round, peeled, incised	32	9.4	17.0	14.1	Soak, copper naphthenate-diesel oil (1 per cent copper), B-144, T-48	3.0	1.2	1.20
Douglas-fir	94	Round, peeled, incised	33	11.6	16.3	13.8	Soak, 5 per cent pentachlorophenol-diesel oil, B-144, T-48	3.5	1.5	1.30
Douglas-fir	95	Round, peeled, incised	32	11.3	17.3	14.1	Soak, Gasco creosote oil, B-144, T-48	3.2	1.5	1.30
Douglas-fir	8	Round, peeled	60	10.0	21.2	16.6	Hot-cold bath, butt Carbolineum "B," B-6	......	......	......
Douglas-fir	18	Round, peeled	60	12.0	18.0	15.8	Hot-cold bath, creosote and crankcase oil (50/50), B-20	......	......	0.88
Douglas-fir	54	Square	0	16.0	16.0	16.0	Hot-cold bath, Gasco creosote, B-6	......	......	0.57
Maple, bigleaf	83	Round, peeled, incised	75	11.0	17.3	14.1	Soak, 5 per cent pentachlorophenol-diesel oil, B-24, T-2	7.49	2.03	2.72
Pine, lodgepole	50	Round, unpeeled	55	12.6	19.8	15.5	Salt, mercuric chloride, and arsenous oxide, 1 hole, butt	......	......	......
Pine, lodgepole	85	Round, peeled, incised	65	11.9	16.0	13.5	Soak, Gasco creosote oil, B-43, T-24	4.1	1.8	1.5
Pine, lodgepole	86	Round, peeled, incised	76	9.7	16.3	13.5	Soak, 5 per cent pentachlorophenol-diesel oil, B-43, T-24	4.1	2.5	1.6
Pine, ponderosa	56	Square	0–35	16.0	16.0	16.0	Soak, Permatol "A," 17 hours	......	......	0.61

*B (butt) and T (top) are followed by treating time in hours.

Table 5. Service Records of Treated Fence Posts

Nonpressure processes

Species	Series number	Number of posts in test	Number of posts removed at last inspection	Number of posts remaining	Average service life of removed posts	Service age of remaining posts	Location and extent of deterioration in remaining posts: Ground-line zone: Little or none	Ground-line zone: Moderate to severe	Top: Little or none	Top: Moderate to severe
					Years	*Years*	*Number of posts*	*Number of posts*	*Number of posts*	*Number of posts*
Cedar, Port Orford white	9	10	3	3	19.4	22.5	0	3	3	0
Cottonwood, black*	27	24	1	19	20.3	21.7	1	18	0	19
Cottonwood, black	68	25	....	25	......	2.8	25	0	25	0
Cottonwood, black	74	22	....	22	......	2.5	22	0	22	0
Cottonwood, black	77	25	....	25	......	2.5	25	0	25	0
Cottonwood, black	78	25	....	25	......	2.6	25	0	25	0
Cottonwood, black	87	25	....	25	......	0.9	25	0	25	0
Douglas-fir	39	25	....	0	5.3	......	....	....	....	....
Douglas-fir	79	25	....	25	......	1.9	25	0	25	0
Douglas-fir	80	25	....	25	......	2.0	25	0	25	0
Douglas-fir	81	25	....	25	......	1.9	25	0	25	0
Douglas-fir	92	25	....	25	......	1.9	25	0	25	0
Douglas-fir	22	25	....	0	6.3	......	....	....	....	....
Douglas-fir*	2	24	....	24	......	23.7	0	24	0	24
Douglas-fir	91	25	....	25	......	1.9	25	0	25	0
Douglas-fir*	3	24	....	24	......	23.7	0	24	2	22
Douglas-fir	4	23	....	23	......	23.7	9	14	11	12
Douglas-fir	89	25	1	24	2.5	2.5	24	0	24	0
Douglas-fir	90	25	....	25	......	2.5	22	3	25	0
Douglas-fir	5	25	3	22	23.6	23.6	14	8	15	7
Douglas-fir	6	25	1	9	18.1	23.6	2	7	4	5
Douglas-fir	24	25	....	22	19.7	21.7	18	4	19	3
Douglas-fir	25	25	....	21	19.2	21.7	14	7	17	4
Douglas-fir	59	12	....	12	......	9.3	12	0	10	2
Douglas-fir	73	25	....	25	......	2.8	25	0	25	0
Douglas-fir	75	25	....	25	......	2.5	25	0	25	0
Douglas-fir	12	25	....	0	7.0	......	....	....	....	....
Douglas-fir	62	25	....	25	......	2.7	25	0	25	0
Douglas-fir	63	25	....	25	......	2.7	25	0	25	0
Douglas-fir	64	25	....	25	......	2.8	25	0	25	0
Douglas-fir	65	25	....	25	......	2.5	25	0	25	0
Douglas-fir	66	25	....	25	......	2.5	25	0	25	0
Douglas-fir	67	25	....	25	......	2.5	25	0	25	0
Douglas-fir	88	23	....	23	......	1.0	23	0	23	0
Douglas-fir	93	25	....	25	......	1.0	25	0	25	0
Douglas-fir	94	25	....	25	......	1.0	25	0	25	0
Douglas-fir	95	25	....	25	......	1.0	25	0	25	0
Douglas-fir	8	22	....	0	12.2	......	....	....	....	....
Douglas-fir	18	24	2	3	16.7	22.4	0	3	1	2
Douglas-fir	54	25	....	25	......	12.0	25	0	25	0
Maple, bigleaf	83	25	....	25	......	2.5	25	0	25	0
Pine, lodgepole	50	25	1	21	8.8	12.9	0	21	14	7
Pine, lodgepole	85	25	....	25	......	0.9	25	0	25	0
Pine, lodgepole	86	25	....	25	......	0.9	25	0	25	0
Pine, ponderosa	56	25	....	22	9.5	11.8	17	5	22	0

* The tops of most or all of these posts have been severely decayed for many years.

Table 6. Characteristics of Treated Fence Posts
Pressure processes

Species	Series number	Number of posts in test	Post description	Sapwood	Ground-line perimeter: Minimum	Ground-line perimeter: Maximum	Ground-line perimeter: Average	Type of preservative treatment
				Per cent	*Inches*	*Inches*	*Inches*	
Douglas-fir	52	25	Square	0	16.0	16.0	16.0	Gasco creosote oil, posts incised, absorption 4.23 pounds per post
Douglas-fir	45	25	Square	0	16.0	16.0	16.0	Chemonite, absorption 7.0 to 22.5 pounds (average 12.8 pounds) per post
Douglas-fir	43	25	Round, peeled	60	12.0	16.7	14.2	Chromated zinc chloride, absorption of 0.78 pounds dry salt per post
Douglas-fir	7	25	Round, peeled	60	12.0	21.0	17.7	70 per cent creosote, 30 per cent fuel oil, absorption 1.5 to 16 pounds (average 7.2 pounds) per post, treated twice
Douglas-fir	51	25	Square	0	16.0	16.0	16.0	Coal-tar creosote and petroleum mixture, average absorption 3.8 pounds per post, posts incised
Douglas-fir	53	25	Square	0	16.0	16.0	16.0	Coal-tar creosote, posts incised, absorption 8.1 pounds per post
Douglas-fir	23	49	Round, peeled	60	11.6	16.7	14.5	Creosote, absorption unknown
Douglas-fir	42	25	Square	0	16.0	16.0	16.0	Wolman salts (Tanalith), dry salt absorption 0.302 pounds per cubic foot, kiln dried after treatment
Douglas-fir	33	25	Square	0	13.9	16.6	14.8	Zinc-meta-arsenite, absorption 0.1 pounds per post, treated twice
Hemlock, western	41	25	Square	0	16.0	16.0	16.0	Wolman salts (Tanalith), dry salt absorption 0.302 pounds per cubic foot, posts kiln dried after treatment
Hemlock, western	44	25	Square	0	16.0	16.0	16.0	Chemonite, absorption 8.5 to 27.5 pounds (average 16.6 pounds) per post

Table 7. Service Records of Treated Fence Posts
Pressure processes

Species	Series number	Number of posts in test	Number of posts removed at last inspection	Number of posts remaining	Average service life of removed posts	Service age of remaining posts	Location and extent of deterioration in remaining posts: Ground-line zone: Little or none	Ground-line zone: Moderate to severe	Top: Little or none	Top: Moderate to severe
					Years	*Years*	*Number of posts*	*Number of posts*	*Number of posts*	*Number of posts*
Douglas-fir	52	25	....	25	......	12.0	25	0	25	0
Douglas-fir	45	25	....	25	......	14.4	25	0	25	0
Douglas-fir	43	25	2	18	10.6	14.7	16	2	18	0
Douglas-fir	7	25	....	25	......	22.6	25	0	25	0
Douglas-fir	51	25	....	25	......	12.0	25	0	25	0
Douglas-fir	53	25	....	25	......	12.0	25	0	25	0
Douglas-fir	23	49	....	49	......	22.4	49	0	49	0
Douglas-fir	42	25	....	25	......	14.8	25	0	25	0
Douglas-fir	33	25	....	24	17.5	18.5	18	6	24	0
Hemlock, western	41	25	....	25	......	14.8	25	0	25	0
Hemlock, western	44	25	....	25	......	14.4	25	0	25	0

Table 8. REMOVAL RECORDS OF UNTREATED FENCE POSTS

Species	Series number	Date set	Number of posts in test	Total number of posts removed	Number of posts removed each annual inspection year																				
					31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Alder, red	16	3- 5-29	25	25	1	6	3	7	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ash, Oregon	28	3-19-30	25	25	....	1	1	8	4	2	5	3	....	....	....	1	....	....	....	....	....	....	....	....	....
Cascara	20	3- 5-29	12	12	1	3	1	4	1	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....
Cascara	47	1-29-38	26	24	....	....	....	....	....	....	....	....	....	1	4	4	1	2	4	1	6	....	1	....	....
Cedar, Alaska yellow	46	11- 6-37	24	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....
Cedar, California incense	29	3-19-30	25	20	....	....	....	1	5	....	1	....	2	....	....	2	2	....	3	....	....	1	3	....	....
Cedar, Port Orford white	21	5- 4-29	25	21	....	....	....	....	....	....	....	....	....	1	....	....	....	....	2	....	2	3	10	....	3
Cedar, western red	10	3- 6-29	25	9	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	4	1	2
Cedar, western red	11	4- 1-29	25	12	....	....	1	....	....	....	....	....	....	....	....	....	....	1	1	1	1	....	3	1	3
Cottonwood, black	14	3- 5-29	25	25	2	6	6	8	2	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood, black	82	3-24-49	25	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Cypress, Arizona	84	10- 6-51	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	1	1- 7-28	25	25	....	4	5	7	4	2	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	55	10-11-39	25	25	....	....	....	....	....	....	....	....	....	....	....	1	6	2	7	2	4	....	3	....	....
Douglas-fir	57	12- 6-39	25	25	....	....	....	....	....	....	....	....	....	....	....	8	8	8	1	....	....	....	....	....	....
Douglas-fir	72	12-17-48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Fir, grand	15	3- 5-29	25	25	1	4	1	3	2	1	3	1	2	1	3	1	2	....	....	....	....	....	....	....	....
Hemlock, western	38	9-20-33	25	25	....	....	....	....	....	3	5	6	6	2	....	1	1	....	....	....	1	....	....	....	....
Juniper, Sierra	30	2-12-30	25	8	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	2	3	....	1
Larch, western	37	9-20-33	25	25	....	....	....	....	....	....	5	9	1	2	2	2	1	....	....	....	....	....	1	....	2
Locust, black	40	4-13-35	22	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Madrone, Pacific	26	2- 6-30	25	25	....	....	3	6	7	3	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Maple, bigleaf	17	3- 5-29	25	25	....	....	....	11	8	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Metal, angle iron	60	11-13-48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Metal, T-post	61	11-13-48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Metal, H-beam	69	12-11-48	9	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Metal, channel	70	12-11-48	10	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Metal, T-post	71	12-11-48	10	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Oak, Oregon white	19	5- 7-29	24*	15	....	....	....	....	....	....	2	5	2	....	2	1	....	....	....	....	....	1	1	....	1
Osage-orange	32	4-15-33	26	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine, lodgepole	48	11- 1-38	26	26	....	....	....	....	....	....	....	....	....	....	4	7	6	5	1	1	1	....	....	1	....
Pine, lodgepole	49	11- 1-38	25	25	....	....	....	....	....	....	....	....	....	....	7	11	6	1	....	....	....	....	....	....	....
Pine, ponderosa	36	9-20-33	25	25	....	....	....	....	....	1	3	7	7	2	1	1	....	1	2	....	....	....	....	....	....
Pine, sugar	35	9-20-33	25	25	....	....	....	....	....	2	2	8	3	2	....	2	....	1	2	2	1	....	....	....	....
Pine, western white	34	9-20-33	25	25	....	....	....	....	....	1	2	7	11	3	....	....	1	....	....	....	....	....	....	....	....
Redwood	58	12-20-39	25	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1
Spruce, Sitka	31	4-15-33	26	26	....	....	....	....	....	4	10	2	1	4	5	....	....	....	....	....	....	....	....	....	....
Tanoak	76	10- 6-51	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yew, Pacific	13	3- 5-29	23	6	....	....	....	....	....	....	1	1	2	....	1	....	....	....	....	....	....	....	1	....	....

* One post was removed for exhibition purposes.

Table 9. Removal Records of Treated Fence Posts

Nonpressure processes

Species	Series number	Date set	Number of posts in test	Total number of posts removed	Number of posts removed each annual inspection year																				
					31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Cedar, Port Orford white	9	4–20–28	10	7	....	....	....	....	....	....	....	....	....	1	....	....	....	2	....	....	1	....	....	....	3
Cottonwood, black	27	2– 6–30	24	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	1	1
Cottonwood, black	68	12–23–48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood, black	74	4–23–49	22	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood, black	77	4– 9–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood, black	78	12–28–48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood, black	87	11– 4–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	39	9–20–33	25	25	....	....	....	....	....	2	6	4	12	1	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	79	11– 5–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	80	10–17–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	81	10– 5–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	92	11–11–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	22	5– 4–29	25	25	1	3	5	3	4	1	3	4	....	1	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	2	1– 7–28	24*	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	91	11–19–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	3	1– 7–28	24*	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	4	1– 7–28	23*†	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	89	3–24–49	25	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Douglas-fir	90	4–17–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	5	3– 6–28	25	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Douglas-fir	6	3–20–28	25	16	....	....	1	....	....	....	....	....	....	....	1	....	4	....	1	....	2	2	4	....	1
Douglas-fir	24	2– 6–30	25	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	1	....
Douglas-fir	25	2– 6–30	25	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	1	1	....
Douglas-fir	59	6– 3–42	12	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	73	12–22–48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	75	4–16–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	12	3–14–29	25	25	1	1	5	4	4	2	5	1	....	1	....	....	....	....	1	....	....	....	....	....	....
Douglas-fir	62	12–29–48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	63	2–19–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	64	12–18–48	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	65	3–20–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	66	3–22–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	67	3–21–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	88	10–21–50	23	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	93	10–21–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	94	10– 7–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	95	10– 7–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Douglas-fir	8	3– 6–29	22	22	....	....	....	....	....	....	2	5	5	2	....	2	....	1	5	....	....	....	....	....	....
Douglas-fir	18	5– 7–29	22	22	....	1	....	....	....	1	....	1	1	2	....	2	....	1	3	1	....	1	3	2	2
Douglas-fir	54	10–11–39	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Maple, bigleaf	83	3–26–49	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine, lodgepole	50	11– 1–38	25	4	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	1	....	....	....	1
Pine, lodgepole	85	11–15–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine, lodgepole	86	11–15–50	25	0	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine, ponderosa	56	12– 6–39	25	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	1	....

* One post was removed for chemical analysis.
† One post was removed for exhibition purposes.

Table 10. REMOVAL RECORDS OF TREATED FENCE POSTS

Pressure processes

Species	Series number	Date set	Number of posts in test	Total number of posts removed	Number of posts removed each annual inspection year									
					42	43	44	45	46	47	48	49	50	51
Douglas-fir	52	10–11–39	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	45	5– 1–37	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	43	2–13–37	25	7	1	....	2	....	....	1	....	1	....	2
Douglas-fir	7	3– 6–29	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	51	10–11–39	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	53	10–11–39	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	23	5–31–29	49*	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	42	12– 5–36	25	0	....	....	....	....	....	....	....	....	....	....
Douglas-fir	33	4–15–33	25	1	....	....	....	....	....	....	....	....	1	....
Hemlock, western	41	12– 5–36	25	0	....	....	....	....	....	....	....	....	....	....
Hemlock, western	44	5– 1–37	25	0	....	....	....	....	....	....	....	....	....	....

* One post removed for exhibition purposes.

T. J. Starker Post Farm Cooperators

Anaconda Copper Mining Co., Wood Preserving Department, Butte, Montana
Bradley-Woodard Lumber Co., Bradwood, Oregon
Carbolineum Wood Preserving Company, Milwaukee, Wisconsin
Chemonite Wood Preserving Co., San Francisco, California
J. W. Copeland Yards, Corvallis, Oregon
Corvallis Lumber Co., Corvallis, Oregon
Harold Dahl, Troutdale, Oregon
Dant & Russell, Portland, Oregon
Dow Chemical Company, Midland, Michigan
Holmes-Eureka Lumber Co., Eureka, California
The Hunt Company, 3700 West Six Mile Road, Detroit, Michigan
C. D. Johnson Lumber Corp., Toledo, Oregon
Kirchmann Hardwood Co., San Francisco, California
McGoldrick Lumber Co., Spokane, Washington
Nuodex Products Co., Inc., Elizabeth F, New Jersey
Osmose Wood Preserving Co. of America, Inc., Buffalo, New York
Pope & Talbot, Inc., St. Helens, Oregon
Portland Gas & Coke Co., Portland, Oregon
R. H. Rawson, Portland, Oregon
Southern Pacific Co., Eugene, Oregon
U. S. Department of Agriculture, Forest Service
- Deschutes National Forest, Bend, Oregon
- Forest Products Laboratory, Madison, Wisconsin
- Pacific Northwest Forest and Range Experiment Station, Portland, Oregon
- Umpqua National Forest, Roseburg, Oregon
- Willamette National Forest, Eugene, Oregon

Washington Wood Preserving Co., Spokane, Washington
West Coast Wood Preserving Co., Seattle, Washington
West Oregon Lumber Co., Portland, Oregon
Western Pine Association, Portland, Oregon
Weyerhaeuser Timber Co., Klamath Falls, Oregon
Willamette Valley Lumber Co., Dallas, Oregon

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