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Preservative Treatments of Fence Posts

1945 Progress Report on the Post Farm

By

T. J. STARKER

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Preservative Treatments of Fence Posts

1945 Progress Report on the Post Farm

By

T. J. STARKER*

Professor of Forestry

On December 20, 1945, the Post Farm was given its annual inspection which is the eighth time these posts of various species and treatments have been tested for failure. This year 36 posts were removed from the test plot, compared to 29 for 1944, 39 in 1943, and 49 in 1942. There were four series in which the last posts were removed, and their average lengths of life in months are indicated on the accompanying bar-graph, Figure 2, along with 13 other series which have been removed.

RECORDS OF POST SERIES

Table 1, appearing in previous supplements, has been brought up to date by addition of the following new data:

Series 6. One failure was recorded in these Douglas-fir round posts treated with Anaconda Mining Company granulated treated dust. This is the seventh post that has failed in this series. Because of the difficulty of properly treating posts with this dust, this company perfected the same preservative into a paste. Posts treated with this material (Series 24 and 25) have shown no failures after approximately 15 years of service.

Series 8. Five failures in these Douglas-fir round posts using a "B" treatment by the Carbolineum Wood Preserving Company completed the life of the 22 posts that were in this series. They were planted in 1929 and had an average life of 148 months. This series has the longest life of any posts that have been completely removed thus far.

Series 10 and 11. In 1929, 50 western red cedar posts were divided into two groups, light wood and dark wood. To date, there have been 2 failures in the dark series and 3 in the light.

Series 12. Consisting of 25 round Douglas-fir steeped in zinc chloride, this series has a rather odd failure record as failures ex-

* On leave of absence.

tended from the second year after their insertion in 1929 to one failure in 1945 which completed the series. The average life for this treatment was 74 months.

Series 18. Three failures were recorded in the 25 Douglas-fir posts treated with crankcase oil and creosote. These posts have shown a spotted failure pattern also.

Series 21. These posts were split Port Orford Cedar and have shown only 3 failures since 1929 when they were planted. Two of these failures occurred this year.

Series 29. Split incense cedar in this series showed 3 failures in the 1945 examination.

Series 34, 35, 36. These series composed of eastern white pine, sugar pine, and ponderosa pine have almost all run their course. Two posts were removed from the sugar pine series and 4 from the ponderosa pine. This gives an average life of 69 months for western white and 77 months for ponderosa. Sugar pine has 3 posts remaining in the test plot.

Series 47. Cascara, apparently from the failure pattern developing, is not going to prove a long-lived post. Four posts have failed to resist the 50-pound pull at this examination, and this makes 16 that have failed at the end of 7 years of service.

Series 48 and 50. Of these lodgepole pine posts, 1 failure was recorded in Series 48 and 1 in No. 50. Series 48 is dead and untreated and has had 23 failures while No. 50 was "salt" treated and has had only 2 failures.

Series 55. The 4 x 4 untreated Douglas-fir of this series had the largest number of failures of any series in 1945 when seven posts gave way to the standard pull.

Series 57. Being 4 x 4 heartwood Douglas-fir, this series is of the same character as No. 55. One post remained in the farm after previous removals, and it was taken out at this examination. This check series had an average life of 57 months.

POST SERIES SPECIES AND TREATMENTS

In order to make the detailed information on each series of posts readily available as to treatment, percentage of sapwood, character and amount of preservative, source, etc., the material published in the 1938 and 1940 Progress Reports is repeated in this issue.

Series 1 consisted of second-growth Douglas-fir cut from the McDonald forest and averages about 25 years in age. Estimated 60 per cent sapwood, averaging 0.78 inch. These figures apply to other posts cut from the same place. Planted without any treatment, green with bark on. Of the 25 posts, all failed in 11 years. Average life 84 months.

Series 2. Source, size, sap, and age same as Series 1. Treated with 1 tablespoon of corrosive sublimate and common salt in one $\frac{3}{4}$ -inch hole bored at ground line. No failures to date. Directions for this treatment appear in the appendix following the descriptions of the various posts series.

Series 3. Same as Series 2 with arsenic added to the mixture and using two holes at ground line.

Series 4. Same as Series 3 except that three holes were used. No failures to date.

Series 5 and 6. Source, size, sap, and age same as Series 1. Series 5 treated with Anaconda Copper Company treater dust and Series 6 with granulated treater dust according to specifications of the Anaconda Company at that time (March 20, 1928).

Series 7. Consists of 25 posts similar in original quality to Series 1. Cut on December 23, 1927 and planted on March 6, 1929. Treated by the Southern Pacific Railroad Company at Eugene under pressure, using 70 per cent creosote and 30 per cent fuel oil. The posts retained from 1½ to 16 pounds of this mixture, the exact amount for each post being noted in Table 1. No failures to date. Average moisture content before treatment 22.2 per cent.

Series 8. Same quality of original post as Series 7. Cut and planted at same time and given a "B" treatment by the Carbolineum Wood Preserving Company of Springfield, Oregon.* An open-tank treatment. Average life 148 months.

Series 9. Consists of 10 white-cedar tops left over from treating long poles by the above-named company. Given an open-tank treatment, and planted April 20, 1928. Estimated sap 25 per cent.

Series 10 and 11 consists of 50 western red-cedar posts purchased from a local lumber yard. Sorted into light-colored and dark-colored lots and planted in different rows. 100 per cent heartwood.

* Applied to Series 8 and 9. The treatment consists of immersion in hot oil at a temperature of 225 to 230 F for 4 hours and a bath in oil at a temperature of 150 F for not less than 2 hours. The dryness of the material treated would determine the penetration. There is no definitely assured penetration in this open-tank treatment.

Series 12. Quality of original posts equal to Series 1. Steeped in zinc-chloride solution for 8 days to a height of 3 feet. The treating mixture consisted of 10 pounds of $ZnCl_2$ in 200 pounds of water. Average life 72 months.

Series 13. Consists of 23 round yew posts without treatment. One of the smallest posts, 12.5 inches in circumference, failed October 20, 1937, and another small one in 1938. Estimated 90 per cent heartwood.

Series 14. Consisted of 25 split black-cottonwood posts without treatment. All failed in nine years. In 7 years 24 perished. Estimated 80 per cent heartwood. Average life 55 months.

Series 15. Consisted of 25 split lowland white-fir posts. Estimated 35 per cent heartwood. Average life 100 months.

Series 16. Consisted of 25 split alder untreated. All removed within a period of 7 years. Estimated 75 per cent heartwood. Average life 69 months.

Series 17. Consisted of 25 big-leaf maple. All removed in a period of 9 years. Estimated 75 per cent heartwood. Average life 76 months.

Series 18. Consists of 25 round Douglas-fir of similar quality, origin, age, and size as Series 1. After cutting and peeling, they were stored in the Forestry Building basement over winter and thoroughly seasoned. Treated by means of an open tank with crankcase oil, 50 per cent; creosote, 50 per cent.

Series 19. Consists of 25 Oregon-oak split posts with no treatment. Estimated heartwood 80 per cent.

Series 20. Consisted of 12 exceptionally small, round cascara posts. Estimated heartwood 30 per cent. Average life 57 months. Another series of cascara posts has been cut and placed in the post farm. (See Series 47.)

Series 21. Consists of 25 Port Orford cedar split posts with no treatment. Estimated heartwood is 100 per cent. Contributed by Dant and Russell, Portland, Oregon.

Series 22. Consisted of 25 Douglas-fir. Charred approximately $\frac{1}{4}$ inch deep around the entire circumference and $2\frac{1}{2}$ feet up from the butt. Posts are the same character as Series 1. Average life 76 months.

Series 23. Consists of 50 Douglas-fir round posts of approximately the same character as Series 1 but not cut from Forest-School

land. Supplied and treated by the St. Helens Wood Preserving Plant, St. Helens, Oregon. Amount of preservative per post not known.

Series 24 and 25. Consists of 50 posts the same character as Series 1. Both series treated with Anaconda treater paste, Series 24 with 2 pounds per post and Series 25 with 4 pounds per post.

The National forests of Region 6 (Oregon and Washington) have installed many miles of telephone line, the poles of which are treated with Anaconda paste. During the year 1937, 11 lines, so distributed as to cover the various species used and the climate and soil conditions encountered in the region, were established as experimental lines. One hundred poles in each line were numbered, labeled, and completely described. These posts will be examined and reported on biennially until sufficient information has been obtained to permit conclusions as to the effectiveness of the treatment and the factors influencing the durability.

Series 26. Consisted of 25 madrone posts, both round and split, containing heartwood estimated at 60 per cent. All posts failed within $8\frac{1}{2}$ years. Average life 69.6 months.

Series 27. Consists of 25 cottonwood posts, similar to Series 14, except these were treated with creosote by the open-tank treatment. In comparison with Series 14, where all the posts failed in 9 years, there have been no failures in 9 years among posts receiving this treatment. Posts decaying from the top down. Season checks or very deep splits which held water speeded top decay.

Series 28. Consisted of 25 Oregon-ash split posts with no treatment. Estimated 70 per cent heartwood. Average life 96 months.

Although not a part of the Post Farm, a study was made on 25 ash posts driven on the State College Farm in December 1927. Of these posts 25 were tagged in March 1930 and tested several times thereafter. On January 19, 1938, the date of the last examination, only 3 posts remained standing and these were badly decayed at the ground line. The approximate average life of these posts, largely sapwood, is therefore less than 7 years. The area where these posts were located is wet, and this may have added somewhat to the life of this set which were 2.4 inches to 5.4 inches in diameter at ground line and made from small timber.

Series 29. Consists of 25 incense cedar split posts with no treatment. Obtained from the Willamette National Forest.

Series 30. Consists of 25 round western-juniper posts. Ob-

tained from the Deschutes National Forest. Estimated 60 per cent heartwood.

Series 31. Consisted of 26 heartwood, 4 x 4, Sitka spruce posts without treatment. Contributed by the Pacific Spruce Corporation, Toledo, Oregon. Estimated 100 per cent heartwood. Average life 68 months.

Series 32. Consists of 26 osage orange posts both round and split. Estimated heartwood 90 per cent.

They were obtained from a farm about three miles south of Corvallis where a hedge of these trees had been planted many years ago.

Series 33. Consists of 25 Douglas-fir posts. Treated with ZMA. Contributed by the Washington Wood Preserving Company, Spokane, Washington. Average size $3\frac{3}{4}$ x $3\frac{3}{4}$ sawed. Average retention of dry ZMA salts 0.207 pound per cubic foot. Posts run through the retorts twice in order to get this amount of retention.

ZMA is 95 per cent pure arsenic combined with zinc oxide, acetic acid, and water.

Series 34. Consisted of 25 western-white-pine posts, sawed 4 x 4 rough. Contributed by the Willamette Valley Lumber Company, Dallas, Oregon. All heartwood. Average life 69 months.

Series 35 and 36. Consisted of 25 each sugar pine and ponderosa pine sawed 4 x 4 rough. Contributed by the Weyerhaeuser Timber Company, Klamath Falls, Oregon. 100 per cent heartwood. Average life of ponderosa pine posts 77 months.

Series 37. Consists of 25 western larch posts sawed 4 x 4 rough. Contributed by McGoldrick Lumber Company, Spokane, Washington. Five of the 100 per cent heartwood posts failed in 1937 after only 4 years in service. In 1938, 9 failed.

Series 38. Consists of 25 western hemlock posts. Estimated 100 per cent heartwood. Sawed 4 x 4 rough. Contributed by the Willamette Valley Lumber Company, Dallas, Oregon.

Series 39. Consisted of 25 Douglas-fir posts of the character of Series 1. Brush-treated to above ground line using 1 gallon of asphalt emulsion (Flintkote). Contributed by the Copeland Lumber Yards, Corvallis, Oregon. Average life 75 months.

Series 40. Consists of 22 black locust, split and round, posts purchased from a Corvallis home owner who was cutting the tree down (April 13, 1935). Estimated heartwood 80 per cent.

Series 41. Consists of 25 western hemlock posts sawed 4 x 4 rough and vacuum-pressure-treated with Wolman salts (Tanalith) obtaining 0.302 pound of retention per cubic foot. Treated by the Crossett-Western Company, Wauna, Oregon. Posts were contributed by Bradley-Woodard Lumber Company, Bradwood, Oregon. Estimated 100 per cent heartwood.

Series 42. Same as Series 41 but Douglas-fir. Both the hemlock and Douglas-fir were of select structural quality and were kiln dried after treatment.

Series 43. Consists of 25 round posts about 4½ inches in diameter. Treated under pressure with chromated zinc chloride in water solution, absorption per cubic foot of wood being 1 pound of dry salts. In treatment posts subjected to a maximum temperature of 140° F. and maximum hydraulic pressure of 160 pounds per square inch. Chromated zinc chloride consists of about 85 per cent zinc chloride and 18 per cent sodium dichromate. Estimated 40 per cent heartwood. Posts furnished by the West Coast Wood Preserving Company, Seattle, Washington.

Series 44 and 45. Consists of 25 western hemlock and 25 Douglas fir 4 x 4 rough sawed treated with Chemonite. Both sets contributed by the Chemonite Wood Preserving Company, San Francisco, California. Estimated 100 per cent heartwood. Treated to refusal at 150 pounds pressure. Hemlock posts absorbed from 8.5 pounds to 27.5 pounds per post while Douglas-fir used 7.0 pounds to 22.5 pounds each.

Series 46. Consists of 24 Alaska cedar (*Chamaecyparis nootkatensis*) posts split from a down tree located on the Willamette National Forest. Estimated 100 per cent heartwood.

The 36-inch tree was felled in 1933 near Elk Lake, Oregon, at an elevation of 4,800 feet. The posts were cut in September 1937 and hauled to Corvallis on September 21, 1937.

Series 47. Consists of 26 cascara posts contributed by Harold Dahl, senior in forestry, Oregon State College. Posts untreated except that one had been peeled and was dry. All other green with the bark retained. Average size 5.5 inches. Estimated 35 per cent heartwood.

Series 48, 49, 50. Consist of lodgepole pine contributed by Ranger Harold Bowerman of the Umpqua National Forest. All round posts and average 55 per cent sapwood and 4 to 6 inches in diameter. The three series are made up as follows: Series 48, 26 untreated dead posts; Series 49, 25 untreated live posts; and Series

50, 25 posts treated with one part each of HgCl_2 , As_2O_3 , and NaCl . One tablespoon per post inserted in a hole just above ground line. All planted November 1938. Average life, series 49, 48 months.

Series 51. Consists of 25 Douglas-fir posts stamped in the top, M-1 to M-28, with numbers 8, 11, and 27 missing. Missing posts used for other test purposes. Treated in the full-size retorts of Pope & Talbot with a coal-tar creosote-petroleum mixture. Average absorption was 6.20 pounds per cubic foot. Planted October 11, 1939.

Series 52. Consists of 25 Douglas-fir posts stamped P-1 to P-25 on the top cross-section. Treated with Gasco creosote in the experimental plant of Pope & Talbot. Average absorption 7.62 pounds per cubic foot.

Post No. P-28 was cut at 4 points, 1 foot apart, and the blocks tested for penetration which averaged a little over 0.7 inch. The average absorption was 7.62 pounds per cubic foot.

Series 53. Consists of Douglas-fir posts stamped C-1 to C-28 on the top cross-section with numbers 8 to 11 and 27 missing. Post C-10 is 18 per cent sapwood. All others 100 per cent heartwood. Treated in the full-size retorts of Pope & Talbot with other commercial orders using straight coal-tar creosote. The average absorption was 13 pounds per cubic foot. Planted October 11, 1939.

It was desired to obtain only 8 pounds per cubic foot; but because of the large sizes of the commercial material in the retorts at the same time, this was not possible with these small posts.

Posts in Series 51, 52, and 53 were all run through an incising machine, and the chisel or incisor marks may be seen in the reproduced photograph (Figure 1). They average 0.40 inch in depth.

Series 54. Consists of 4 x 4 rough Douglas-fir marked with aluminum tags numbered 1877 to 1901.

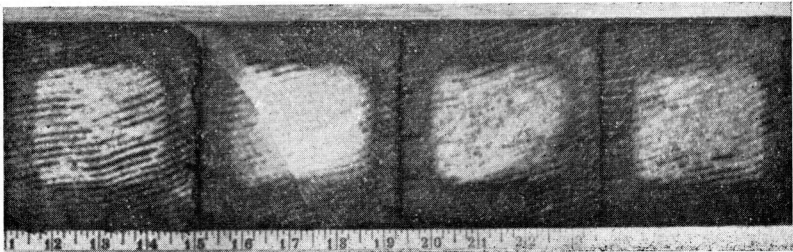


Figure 1. Sections of sample posts from Series 51, 52, and 53 showing penetration and incisor marks.

Treated green by the open-tank method using Portland Gas & Coke Company (Gasco) creosote oil. Planted October 11, 1939.

The posts were kept 3 hours in the oil heated to 200° F. and then quickly transferred to an oil bath at 100° and held for another 3 hours. The specific gravity of the oil was 1.02, weighing 8.52 pounds per gallon. The volume of oil absorbed per post was 0.067 gallon. Approximately 30 inches of the post were treated, and the penetration was less than $\frac{1}{4}$ inch. The posts were not seasoned, but no moisture determinations were made before treatment.

Series 55. Consists of 25 posts stamped on top cross-section from 1 to 28, with numbers 8, 11, and 27 missing. Untreated 4 x 4 Douglas-fir cut from the same long cants as Series 51, 52, and 53. Cut at the St. Helens mill of Pope & Talbot Lumber Company. Planted October 11, 1939.

In all, 31 sticks 4 x 4 inches x 20 feet long were cut for this test. The long sticks were recut to five-foot lengths and a cutting chart made. Moisture determinations were made on each cant and are recorded in the office files. The test material was obtained from the Portland Gas & Coke Company without cost. R. H. Rawson, consulting engineer, supervised the treatments on the series numbered 51, 52, 53, 54, and 55. All posts were 100 per cent heartwood except No. 10 in Series 52.

Series 56. Consists of 25 ponderosa pine 4 x 4 rough posts treated with *Permatol "A"* Treating Solution as manufactured by the Monsanto Chemical Company. Treatment consisted of soaking 17 hours in a cold solution. Posts absorbed the solution at a rate slightly in excess of 1 pound per cubic foot. Most of the posts 100 per cent heartwood, but 7 contain sap. Absorption and percentage of sapwood for each post are recorded in the office files.

Note: Because of the recent interest in the use of pentachlorophenols as post preservatives, the following formula for *Permatol "A"* is given:

1. Pentachlorophenol 5 pounds
2. Pure oil or other solvent oil 1 gallon
3. Spreader 1 $\frac{1}{4}$ gallons
4. Penetrant 10 $\frac{3}{4}$ gallons

The amount of sapwood and the pounds of absorption per cubic foot are recorded for each post.

Series 57. Consists of 25 untreated Douglas-fir supplied by the Corvallis Lumber Company, Corvallis, Oregon. Numbered on top with aluminum tags reading from 400 to 424 inclusive. Some posts

coarse grained and will be inspected to see if this factor influences the rate of decay. Planted December 6, 1939. Average life 57 months.

Series 58. Consists of 25 fir posts of heart redwood. Contributed by the Holmes Eureka Lumber Company, Eureka, California. These posts are of foundation grade.

Series 59. Consists of 12 Douglas-fir round posts treated with Chemonite preservative by the tire tube method. Planted and numbered 219 to 230 inclusive on June 3, 1942. Absorption was from 4 to 8 pints of liquid preservative per post.

Ranging from 5 to 8 inches in diameter, the posts are slightly larger than those used in the earlier series of salt treatments. The 1942 series of twelve treated posts is a presentation of the West Oregon Lumber Company.

Appendix

SALT TREATMENT FOR POSTS AND POLES

1. **History of use.** The use of various salts in treating fence posts to retard decay has been practiced for about 35 years in Oregon. The School of Forestry has been testing this treatment for 15 years and results are shown under the proper series. Posts and poles that have been treated by individuals and companies have been examined. Results obtained indicate that the method has much merit and is worthy of use.

2. **Material.** It is important that green material be used, since the efficiency of the treatment depends on the amount of moisture in the post and that added by absorption. This moisture dissolves the salts and carries them through the fibers of the wood. The bark need not be removed.

3. **Formula.** The material used consists of equal parts, by weight, of corrosive sublimate, arsenic, and common salt. A tablespoon of this mixture is sufficient for a 4-inch post.

4. **Application.** A $\frac{3}{4}$ -inch hole should be bored in the post or pole about 6 inches above the ground line, slanting downward. This hole can best be bored before the post is set in the ground. After the required amount of mixture is inserted, the hole should be stopped with a cork or wooden plug to prevent livestock licking the

poison. If larger posts or poles are used, 2 or more holes are suggested. For example, 2 holes for 8-inch and 3 holes for 10 to 12-inch pieces.

5. **Cost.** The cost will depend on the charge made for the various salts, but should not be in excess of 10¢ (1946) per 4-inch post. Commercial grades of the chemicals are adequate and are less expensive than the more highly refined products. The foregoing cost figure obviously does not include labor for preparation of the posts for treatment.

6. **Advantages.** The advantages of salt treatment may be listed as follows:

- a. The method is inexpensive.
- b. A life of 15 years has been obtained with 4-inch Douglas-fir posts treated in this manner. This represents a saving in replacements.
- c. In many cases posts can be cut along the fence line, thus saving transportation costs.
- d. No time or labor is needed in seasoning material used.
- e. No expensive equipment is necessary.
- f. No particular skill or experience is required in making the application.
- g. Small material and thinnings, which would otherwise be wasted, can be used.

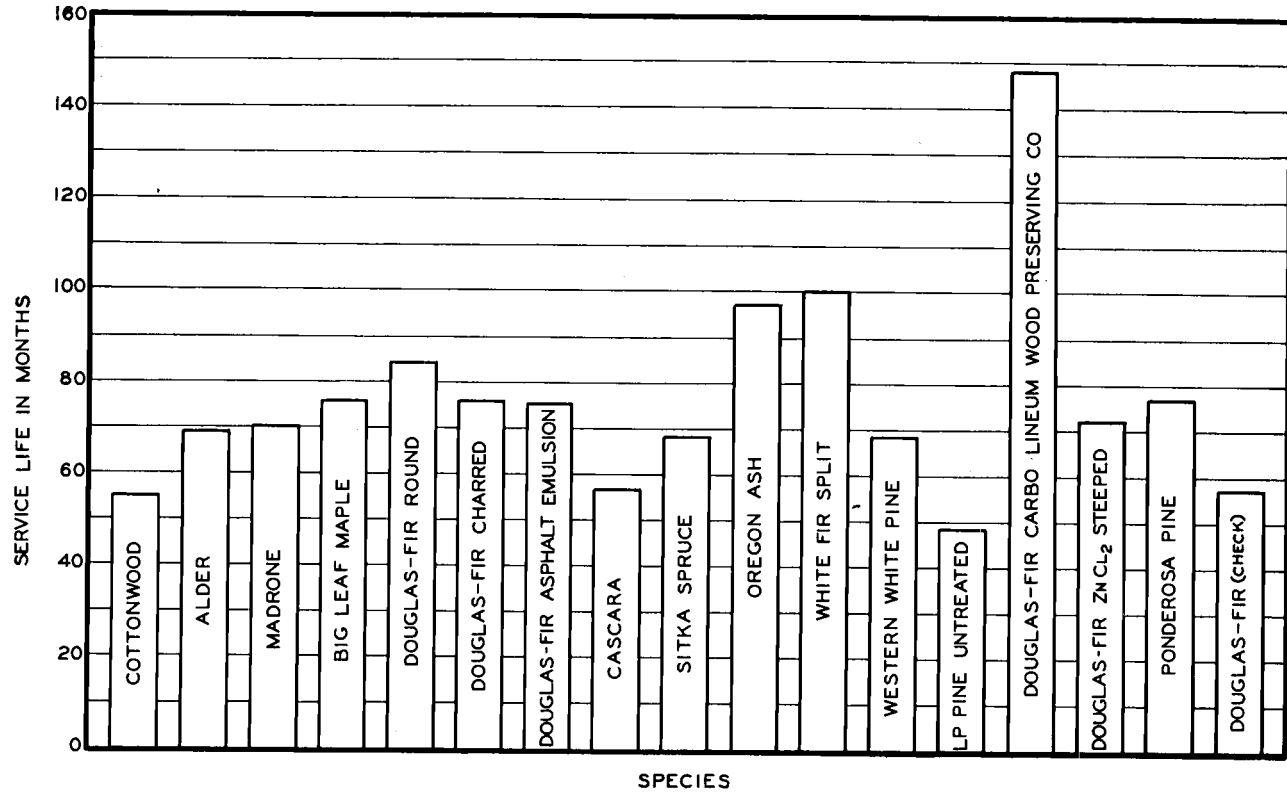


Figure 2. Average service of posts that have failed 100 per cent.

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