



## A Durability Test of Wood Posts in Hawaii .....Second Progress Report

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**ABSTRACT:** Exposure of double-diffusion treated and untreated round posts of Hawaii-grown wood showed that (a) untreated 3- to 5-inch posts of 10 species will last from less than a year to 3 years, depending on species, and that (b) except for three species, the treatment did not afford a service life long enough to justify using it.

length in tanks with copper chromate-copper arsenate by the double-diffusion process.<sup>1</sup>

An exposure test of round fence posts of 10 species of Hawaii-grown wood was set up in Makiki Valley, Honolulu in September 1961. Untreated posts were compared with posts that had been treated full-

Two-year results of this test have been reported previously.<sup>2</sup> These early results were not too comprehensive. Now, after 4 years, the data are becoming more complete. Only 15 of the original 205 untreated posts are still serviceable. The treated posts are also failing; 181 of the original 254 posts remain.

Norfolk-Island-pine and sugi are the only species among the posts that have had no failures as yet (table 1). It may be significant that they are the only softwoods in the test. Baechler and Roth<sup>3</sup> have also observed that hardwood posts treated by double-diffusion do not hold up as well as softwoods--possibly because the fungi that attack hardwoods are more resistant to inorganic toxics than those that attack softwoods.

Penetration of chemicals (not shown in table) was satisfactory only in Norfolk-Island-pine, saligna eucalyptus, and ohia-lehua.<sup>4</sup> Though the data do not show a longer service life for the latter two of

<sup>1</sup>Baechler, R. H. How to treat fence posts by double-diffusion. U.S. Forest Serv. Forest Prod. Lab. Rpt. 1955, 6 pp., illus. 1962.

<sup>2</sup>Skolmen, R. G. A durability test of wood posts in Hawaii...First progress report. U. S. Forest Serv. Pacific SW. Forest & Range Expt. Sta. Res. Note PSW-34, 3 pp. 1963.

<sup>3</sup>Baechler, R. H., and Roth, H. G. The double-diffusion method of treating wood: A review of studies. Forest Prod. Jour. 14(4): 171-176. 1964.

<sup>4</sup>Baechler, R. H., and Gjovik, L. R. The chemical analyses of posts of Hawaiian species treated in tanks by double-diffusion. U. S. Forest Serv. Forest Prod. Lab. 4 pp. 1962. (Limited distrib.)

Table 1.--Condition of round, 3- to 5-inch Hawaii-grown wood posts, untreated and preservative treated with copper chromate-copper arsenate by double-diffusion, Makiki Valley, September 1965

| TREATED POSTS                                     |               |                                              |                               |                                         |              |                            |                |          |                            |
|---------------------------------------------------|---------------|----------------------------------------------|-------------------------------|-----------------------------------------|--------------|----------------------------|----------------|----------|----------------------------|
| Species                                           | Posts in test | Average preservative retention <sup>1/</sup> | Average ground-line, diameter | Average sapwood thickness <sup>2/</sup> | Service-able | Posts removed because of-- |                |          | Average life <sup>3/</sup> |
|                                                   |               |                                              |                               |                                         |              | Decay                      | Decay termites | Termites |                            |
|                                                   | No.           | Lbs/cu. ft.                                  | Inches                        | Inches                                  | Percent      | Percent                    | Percent        | Percent  | Years                      |
| Bluegum eucalyptus ( <i>Eucalyptus globulus</i> ) | 25            | 0.61                                         | 3.9                           | 0.7                                     | 92           | 8                          | 0              | 0        | --                         |
| Brushbox ( <i>Tristania conferta</i> )            | 25            | .79                                          | 3.9                           | 1.0                                     | 64           | 32                         | 0              | 0        | 5.0*                       |
| Longleaf casuarina ( <i>Casuarina glauca</i> )    | 25            | .65                                          | 3.7                           | 1.8                                     | 52           | 44                         | 4              | 0        | 4.5*                       |
| Norfolk-Island-pine ( <i>Araucaria excelsa</i> )  | 25            | .93                                          | 4.1                           | --                                      | 100          | 0                          | 0              | 0        | --                         |
| Ohia-lehua ( <i>Metrosideros collina</i> )        | 26            | .73                                          | 4.2                           | .9                                      | 73           | 27                         | 0              | 0        | 5.0*                       |
| Robusta eucalyptus ( <i>Eucalyptus robusta</i> )  | 25            | .57                                          | 3.6                           | 1.0                                     | 56           | 36                         | 8              | 0        | 4.5*                       |
| Saligna eucalyptus ( <i>Eucalyptus saligna</i> )  | 25            | 1.03                                         | 4.1                           | 1.5                                     | 44           | 56                         | 0              | 0        | 4.0*                       |
| Silk-oak ( <i>Grevillea robusta</i> )             | 26            | .91                                          | 3.8                           | .9                                      | 53           | 35                         | 12             | 0        | 4.5*                       |
| Sugi ( <i>Cryptomeria japonica</i> )              | 26            | .77                                          | 4.2                           | --                                      | 100          | 0                          | 0              | 0        | --                         |
| Turpentine-tree ( <i>Syncarpia glomulifera</i> )  | 26            | 1.15                                         | 3.4                           | .9                                      | 77           | 23                         | 0              | 0        | 5.5*                       |
| UNTREATED POSTS                                   |               |                                              |                               |                                         |              |                            |                |          |                            |
| Bluegum eucalyptus ( <i>Eucalyptus globulus</i> ) | 25            | --                                           | 3.9                           | .8                                      | 24           | 16                         | 40             | 20       | 3.0                        |
| Brushbox ( <i>Tristania conferta</i> )            | 25            | --                                           | 4.1                           | 1.1                                     | 4            | 68                         | 28             | 0        | 1.7                        |
| Longleaf casuarina ( <i>Casuarina glauca</i> )    | 10            | --                                           | 3.8                           | 1.9                                     | 0            | 100                        | 0              | 0        | 1.0                        |
| Norfolk-Island-pine ( <i>Araucaria excelsa</i> )  | 10            | --                                           | 4.6                           | 2.0                                     | 0            | 10                         | 10             | 80       | 1.4                        |
| Ohia-lehua ( <i>Metrosideros collina</i> )        | 25            | --                                           | 4.2                           | .8                                      | 0            | 96                         | 4              | 0        | 2.4                        |
| Robusta eucalyptus ( <i>Eucalyptus robusta</i> )  | 25            | --                                           | 4.0                           | .8                                      | 8            | 60                         | 32             | 0        | 2.4                        |

Table 1.--Condition of round, 3- to 5-inch Hawaii-grown wood posts, untreated and preservative treated with copper chromate-copper arsenate by double-diffusion, Makiki Valley, September 1965, (continued)

| Species                                                 | Posts in test | Average preservative retention <sup>1</sup> | Average ground-line diameter | Average sapwood thickness <sup>2</sup> | Serviceable | Posts removed because of-- |                |          | Average life <sup>3</sup> |
|---------------------------------------------------------|---------------|---------------------------------------------|------------------------------|----------------------------------------|-------------|----------------------------|----------------|----------|---------------------------|
|                                                         |               |                                             |                              |                                        |             | Decay                      | Decay termites | Termites |                           |
|                                                         |               |                                             |                              |                                        |             | Percent                    | Percent        | Percent  |                           |
| <i>Saligna eucalyptus</i> ( <i>Eucalyptus saligna</i> ) | No.           | Lbs/cu. ft.                                 | Inches                       | Inches                                 | Percent     | Percent                    | Percent        | Percent  | Years                     |
|                                                         | 25            | --                                          | 3.7                          | 1.7                                    | 0           | 92                         | 8              | 0        | .8                        |
| Silk-oak ( <i>Grevillea robusta</i> )                   | 10            | --                                          | 4.5                          | 1.1                                    | 0           | 20                         | 80             | 0        | 2.2                       |
| Sugi ( <i>Cryptomeria japonica</i> )                    | 25            | --                                          | 4.1                          | 1.3                                    | 16          | 36                         | 16             | 32       | 2.9                       |
| Turpentine-tree ( <i>Syncarpia glomulifera</i> )        | 25            | --                                          | 3.5                          | 1.0                                    | 8           | 84                         | 8              | 0        | 1.9                       |

<sup>1</sup>Source: Baechler and Gjovik (1962); see footnote 4.

<sup>2</sup>Removed posts only.

<sup>3</sup>Average life is when 60 percent of posts were removed; if less than 60 percent but more than 10 percent were removed, asterisk indicates estimate was made from figure 3 in MacLean, J. D. Percentage renewals and average life of railway ties. U.S. Forest Serv. Forest Prod. Lab. Rpt. 886. 1957.

these species as compared with the others, stronger solutions and more lengthy soaking periods might have increased their service life.

Among the treated hardwoods, bluegum eucalyptus is best, with turpentine-tree and ohia-lehua next. The average service life that has been estimated wherever possible for each treated species is so short that treatment as used in this experiment does not appear to be economically justified except, perhaps, for Norfolk-Island-pine, sugi, and bluegum eucalyptus. Though double-diffusion treatment nearly doubled the average life of all posts, other preservatives or methods of treatment probably would have extended the service life much more. Numerous tests of hardwood posts treated by other methods show much longer service lives.<sup>5</sup>

None of the untreated posts had a particularly long service life. Bluegum eucalyptus and sugi were best and might have lasted even longer in a termite-free soil--the type generally found on ranches and farms in Hawaii. Casuarina ("Ironwood" in Hawaii) and saligna eucalyptus--both almost entirely sapwood--failed very rapidly. If 6- to 7-inch-diameter untreated posts are to be used--as is generally the practice in Hawaii--the data indicate that bluegum eucalyptus is the most durable among the 10 species tested. Posts properly treated with a standard preservative could be expected to last even longer.

A final report of this research will be made when the data become complete.

<sup>5</sup>Blew, J. O., and Kulp, J. W. Service records on treated and untreated fence posts. U.S. Forest Serv. Forest Prod. Lab. Res. Note FPL-068, 52 pp. 1964.

#### The Author

ROGER G. SKOLMEN's first Forest Service assignment, in 1959, was as a member of the Experiment Station's soil-vegetation survey in Berkeley and Arcata, Calif. In early 1961, he joined the station's research staff in Honolulu, Hawaii, where he has been investigating the uses, properties, and processing of forest products. He holds bachelor's and master's degrees in forestry from the University of California, Berkeley.