



Preservative-Treated Wood for Foundations

By

Rodney C. DeGroot, Research Plant Pathologist
Lee R. Gjovik, Forest Products Technologist
and
Andrew J. Baker, Research Chemical Engineer

Abstract

General information is presented about the use of preservative-treated wood in foundations.

Introduction

Wood is an important construction material because of its favorable cost, strength, working characteristics, and availability. Nevertheless, it has natural enemies, namely decay fungi, termites, and other insects. Where wood is at a high moisture content as a result of exposure to weather or contact with the soil, or is used in important structural components such as poles, sills, or foundations, protection from decay and insect attack is achieved through use of indepth, preservative treatments.

Several levels of protection are available with preservative treatments. The main difference in protection levels is the amount of preservative chemical forced into the wood. Considerations of cost and difficulty of replacement led to the development of specific standards for wood in foundation materials that include a margin of safety. It is important that only wood which meets these standards be used in wood foundations.

Treatment Standards

Major building codes and the U.S. Department of Housing and Urban Development (FHA) Minimum Property Standards require that each piece of lumber and plywood in wood foundations be identified with the American Wood Preservers' Bureau (AWPB) "FDN" grademark to indicate conformance with standards that were developed for wood foundations. A reproduction of this stamp is shown in figure 1.

The AWPB "FDN" grademark is applied only to wood treated under the quality control provisions of the American Wood Preservers' Bureau, P.O. Box 6085, 2772 South Randolph Street, Arlington, VA 22206. This grademark provides assurance that the products meet the treatment level required by the standards of the AWPB, and the requirements of Federal Specification TT-W-571 (copies available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402). These standards require that wood for foundations be treated to

a retention of 0.6 pound of preservative per cubic foot of wood. Adequate treatment of each veneer in plywood is essential for long-term structural durability. For this reason, industry standards require sample borings to check penetration of each charge of plywood, and these borings must show all veneers to have been penetrated. The standards further stipulate that additional preservatives be applied to exposed ends and edges of lumber cut after treatment and that the amount of heartwood in treated materials of certain species be restricted to within certain allowable limits.

One research study, initiated at the Forest Products Laboratory in 1937, explored the utility of creosote-treated wood in a house foundation. That foundation gave excellent service, but creosote-treated wood is not accepted today for use in residential foundations. The only wood preservatives accepted for use in residential wood foundations are chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA). These preservatives are often referred to as waterborne preservative treatments because the wood is treated with a solution of chemicals dissolved in water. As the wood dries, these chemicals become permanently fixed within the wood. Once the wood is dry, these treatments leave a dry, paintable surface. Foundations built with waterborne preservative-treated wood have been used in private residential construction since 1969.

Preservatives Tested First

Before a wood preservative treatment is accepted, it is extensively evaluated for its effectiveness. A preservative must pass both laboratory and field tests before it can be used in buildings. Laboratory tests are conducted first. The preservatives that resist termites and decay fungi in the laboratory are selected for field trials. In field tests, 2- by 4-inch stakes, 18 inches long, treated with different amounts of the test preservatives are half-buried in an upright position in the soil. These stakes are exposed in fields for decades and examined periodically. The Forest Products Laboratory maintains field plots in Wisconsin and Mississippi. Wood in southern Mississippi is exposed to severe decay and termite attack. Untreated (control) 2- by 4-inch stakes of southern pine sapwood last about 2 to 4 years in the Mississippi plot and approximately 4 to 6 years in the test plot near Madison, Wis.

Stakes of southern pine sapwood treated with waterborne preservatives at levels comparable to those specified for wood foundations have been exposed in the soil in southern Mississippi for more than 30 years with no failure. Specifically, 2- by 4-inch stakes of southern pine sapwood treated with ACA at retentions of 0.24 to 1.25 pounds per cubic foot of wood have been in test for 32 years, while comparable stakes treated with CCA-I at a retention of 0.15 to 0.44 pound per cubic foot have been in test for 31 years. Stakes treated with CCA-II at retentions of 0.26 to 1.04 pounds per cubic foot have been in test for 29 years. No failures have occurred in test stakes treated with ACA at retentions of 0.51 or more pound per cubic foot; in test stakes treated with CCA-I at retentions

above 0.29 or more pound per cubic foot of wood; nor in test stakes treated with CCA-II at retentions of 0.26 or more pound of preservative chemical per cubic foot of wood. By comparison, 0.6 pound of preservative chemical per cubic foot of wood is required by the treatment standards for material used in wood foundations.

Since there have been no failures in stakes treated at retentions comparable to those used in wood foundations, firm predictions of service life for these stakes cannot be made, but prior experience with other preservatives leads us to conclude that these stakes will last substantially longer. Environmental studies of soils in Forest Products Laboratory field plots in Mississippi indicated no movement of chemical beyond 3 or 6 inches from treated wood stakes, depending upon the formulation that was used.

Cautions

Even though both laboratory and field tests demonstrate that pressure-treated wood is, itself, resistant to attack by termites, subterranean termites can build shelter tubes over treated wood to gain access to untreated wood in other parts of a house. Termites can also build shelter tubes over concrete foundations. Therefore, where subterranean termites are present, conventional soil treatments around foundations (both wood and concrete) or other methods acceptable to the governing regulatory agency are suggested to protect the whole house from termite attack. Soil treatments should be applied by professional pest-control specialists.

Potentials for metal corrosion should be considered when selecting fasteners for use in preservative-treated wood below grade. Preservative-treated wood foundations are used in a variety of architectural designs. With some constructions, wood is exposed to conditions where it is likely to be at a high moisture content. FPL research with fasteners in ACA- and CCA-treated wood at high moisture content indicates that certain metals and alloys appear durable while others are subject to corrosion. Of those metals and alloys tested in this research, stainless steel Types 304 and 316, copper, and silicon bronze appear to be durable.

Further Information For design specifications and/or further information on wood foundations, contact:

AMERICAN PLYWOOD ASSOCIATION
P.O. Box 11700,
Tacoma, WA 94801 (206/565-6600)

AMERICAN WOOD PRESERVERS' BUREAU
P.O. Box 6085
2772 South Randolph Street
Arlington, VA 22206 (703/931-8180)

AMERICAN WOOD PRESERVERS' INSTITUTE
1651 Old Meadow Road
McLean, VA 22102 (703/893-4005)

NATIONAL FOREST PRODUCTS ASSOCIATION
1619 Massachusetts Avenue, NW.
Washington, D.C. 20036 (202/797-5800)

SOCIETY OF AMERICAN WOOD PRESERVERS, INC.
1401 Wilson Boulevard, Suite 205
Arlington, VA 22209 (703/841-1500)

SOUTHERN FOREST PRODUCTS ASSOCIATION
P.O. Box 52468
Jefferson Bank Building on Causeway Boulevard
New Orleans, LA 70150 (504/834-8544)

WESTERN WOOD PRODUCTS ASSOCIATION
1500 Yeon Building
Portland, OR 97204 (503/224-3930)

For copies of the following Forest Products Laboratory
technical reports write: USDA, Forest Service, Forest
Products Laboratory, P.O. Box 5130, Madison, Wis., 53705

Baker, A. J.

1980. Corrosion of metal in wood products. In *Durability
of Building Materials and Components*, ASTM STP 691,
p. 981-993. P. J. Sereda and G. G. Litvan, eds. American
Society for Testing and Materials.

De Groot, R. C., T. W. Popham, L. R. Gjovik, and T. Forehand
1979. Distribution Gradients of Arsenic, Copper, and
Chromium around Preservative-Treated Wooden Stakes, *J.
Environ. Qual.*, Vol. 8, No. 1.

Gjovik, L. R. and H. L. Davidson

1979. Comparison of Wood Preservatives in Stake Tests
(1979 Progress Report) USDA Forest Service Research Note
FPL-02, December.

Gjovik, L. R., and R. H. Baechler

1977. Selection, Production, Procurement and Use of
Preservative-Treated Wood, Supplementing Federal
Specification TT-W-571. USDA Forest Service, General
Technical Report, FPL-15.



Figure 1.--An example of the AWPB, FDN stamp that is required on each piece of plywood and treated lumber in wood foundations.