# *chapter 13.* PRESERVATIVE TREATMENT

## 13.1 GENERAL

The reasons for providing preservative treatment as protection against wood deterioration have been discussed in various sections of this manual. We repeat them here for emphasis, because American building owners lose hundreds of millions of dollars each year from decay and insect attack.

Nondurable wood (that is, wood not resistant to biological degradation) is food for many types of fungi and for a large variety of insects as well. In addition, other insects use wood members as homes, causing damage even though they do not eat the wood. If wood could always be protected from moisture and installed in a way that ensures good clearance between it and the soil, there would be little need for wood durability, excluding some species of termites and a few other wood-boring insects. Unfortunately, such installations are seldom achieved, and protection of the wood becomes mandatory.

In a broad sense there are two types of durable wood: that coming from the heartwood of trees that provide natural protection, such as redwood and the cedars, and that produced by manufacturers through the addition of toxic chemicals. Naturally durable woods contain toxic chemicals as well, but in their case the tree manufactured and deposited them during heartwood formation. As a result, some species of wood have developed an excellent reputation for resistance both to decay and to insects, although a big disadvantage has always been the degree of variability in this resistance. This variability results from natural variations from tree to tree and from location to location within a tree trunk. Because the general rule is that the most durable wood is the last-formed heartwood at the base of the tree, smaller-diameter and younger trees are less durable than large old ones. As the shift from old growth to young, managed timber has taken place, this factor has increased the variability of naturally durable wood to the point where performance is unpredictable. Use should generally be limited to areas where the consequences of failure are low and the hazard of deterioration is only moderate.

## 13.2 DECAY AND INSECT TREATMENTS

Preservative treatment with toxic chemicals is accomplished by pressure treatment. Nonpressure dips and brush coatings provide only questionable protection. However, field treatment of the cut surfaces

of pressure preservative-treated wood is an extremely important step in proper construction with that material. Wood-preserving chemicals are toxic to insects, fungi, or both. The principal chemicals in use are broad-spectrum biocides with adverse affects on other organisms as well. A great deal of effort is being expended in the search for new preservative systems that are more environmentally acceptable, but the long-term performance requirements for wood preservatives makes this task difficult. At present, most wood preserving is done with the same chemicals that have served so well for decades. Creosote, pentachlorophenol, and waterborne arsenicals and copper compounds are the principal products in use, although other products are available for limited special purposes. Wood preservatives are usually classed according to whether they are oily or non-oily, traits that can be important to the user.

Many factors should be considered when specifying preservative-treated wood products. The first is the nature of the exposure and the organisms that might be expected to attack the wood. Second is the nature of the use, interior or exterior, and the degree of contact with people. A third factor is the service life required and cost of replacement in the event of failure. Finally, and extremely important, is the quality-control program that will provide assurance of proper treatment.

Different preservatives have different characteristics in terms of cleanliness, paintability, glueability, vapor pressure and odor, and corrosiveness. For interior surfaces or areas that will receive human contact, the waterborne arsenical compounds are generally selected. Pentachlorophenol in a light solvent with an appropriate finish applied may be used in limited areas, such as glulam beams. For exteriors, either the pentachlorophenol in light solvent or the arsenicals are appropriate; if odor and an oily, sticky surface are not objectionable, creosote and pentachlorophenol in heavy oil are excellent choices. Many quality-control services are available. For knowledgeable users of large quantities of treated wood, and for industrial products, such as utility poles, railroad ties, and piling, purchasers frequently have their own specifications and provide or contract for quality-control services. For general construction, it is more common to rely upon the services of one of the several existing quality-control programs. Proprietary brand name warranty programs, which guarantee a specified number of years of service, provide much less protection than the more widely used program of the American Wood Preservers Bureau with its LP Standards.

Preservative treatment is normally specified in terms of the exposure hazard, for above ground or for ground contact use. Where replacement costs are high, special heavier treatments are specified, such as the industrial wood foundation treatment. The additional cost of a heavier treatment is usually nominal compared to the additional protection obtained. Considering this, the authors believe that, except for the Formosan termite, the specifications in **Table 13-1** should be followed.

## TABLE 13-1
Suggested Treatments for Different
Commodities and Use Conditions

| | Preservative Systems for Different Exposure Severities | | |
|---|---|---|---|
| APPLICATIONS | High | Mod. | Low |
| Glue laminated timbers | 1 | 1,2 | 3 |
| Sawn timbers | 1,4 | 1,2,5 | 6 |
| Lumber and plywood | 1,4 | 1,2,5 | 6 |

| Preservative Systems | Retention | American Wood Preservers Bureau (AWPB) Standard |
|---|---|---|
| 1. Pentachlorophenol in heavy oil | 0.50 pcf* | LP 77 |
| 2. Pentachlorophenol in light or volatile solvent | 0.50 pcf | LP 33 & 44 |
| 3. Pentachlorophenol in light or volatile solvent | 0.40 pcf | LP 3 & 4 |
| 4. Waterborne arsenicals | 0.60 pcf | FDN |
| 5. Waterborne arsenicals | 0.40 pcf | LP 22 |
| 6. Waterborne arsenicals | 0.25 pcf | LP 2 |

* pcf -- pounds per cubic foot

## 13.3 FIRE-RETARDANT TREATMENTS

The wood-preserving industry prior to 1970 relied upon a limited number of formulations for fire-retardant protection. These systems were incorporated into the standards of the American Wood Preservers Association (AWPA). More recently, as improved systems were developed, fire retardant treatments became proprietary and are now marketed outside the system of AWPA standards. One consequence is the inconsistency in wood properties of material treated by different manufacturers. Two particularly troublesome areas are the strength and the hygroscopicity of fire-retardant treated wood.

The National Forest Products Association, the responsible industry association, makes no recommendations on strength values for use in design; it simply refers the inquirer to the manufacturer. Hygroscopicity, the tendency of a material to extract moisture from moist air, is perhaps even more important in humid climates. Failures have occurred in roof structures and in walls, often where high moisture contents in combination with elevated temperatures apparently have resulted in severe deterioration of the wood. Corrosion failure of metal connectors and fasteners has also been reported.

The industry is aggressively seeking a solution to this serious problem, which has occurred primarily in the eastern part of the country; but there have been western failures as well. Some producers claim to have solved the hygroscopicity problem. In the absence of industry-wide standards, we recommend that users satisfy themselves regarding this issue.