WOOD PRESERVING RESOURCE CONSERVATION AND RECOVERY ACT COMPLIANCE GUIDE

A GUIDE TO FEDERAL ENVIRONMENTAL REGULATION

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Office of Compliance
Office of Enforcement and Compliance Assurance
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Section 1
Introduction

Introduction

The United States Environmental Protection Agency (EPA) has developed this Wood Preserving RCRA Compliance Guide to provide summary information on the statutory and regulatory requirements applicable to wood preserving facilities. The document was developed for facilities that use, or have used, wood preserving chemicals and have the potential to generate waste that is considered hazardous under the Resource Conservation and Recovery Act (RCRA). After numerous inspections of wood preserving facilities, EPA has found that although many plants do effectively control their wastes and comply with environmental regulations, some do not. The purpose of the Guide is to help bring non-compliant facilities into compliance by providing guidance and references to applicable Federal environmental regulations. In addition, it will serve as a reference tool for those facilities already in compliance so that owners/operators may fine tune their understanding of these regulations.

This Guide was developed by a task force consisting of EPA and State inspectors, and was a collaborative effort between these groups. In addition, representatives of the wood preserving industry were consulted about the questions that frequently arise within the industry and the information that would be most useful for Guide readers. The Guide has been reviewed by EPA and State inspectors as well as representatives of the American Wood Preservers Institute (AWPI). EPA would like to thank all of those who participated in the review process.

Although the Guide focuses on requirements imposed under RCRA's hazardous waste management regulations, it also provides brief summaries of other environmental statutes that may affect the wood preserving industry. Explanations of regulatory requirements should help to build a common base upon which both EPA inspectors and

members of the regulated community can form consistent interpretations of the Federal regulations.

The discussions of the statutes and regulations in this document are not intended to be exhaustive, but have been designed to be used for quick reference. They are not meant to replace in-depth analysis of statutes, regulations, or EPA guidance, and should not be considered a replacement for knowledge of the regulations contained in the Code of Federal Regulations (CFR). This document does not change or supersede existing regulations, but rather seeks to clarify them.

Intended Audience

This document has been prepared for wood preserving facilities in the United States. It is intended to provide an easy to understand summary of the Federal environmental compliance requirements under RCRA that regulate wood preserving facilities. EPA hopes that this Guide will assist facility personnel by providing the information they need to achieve and maintain compliance with applicable environmental regulations. EPA also anticipates that the information presented here will be useful to Federal, State, and local inspectors who may not be familiar with wood preserving processes and the various management practices employed by the industry.

Scope of the Compliance Guide

The Guide provides a general overview of the wood preserving industry in the United States and the Federal environmental regulations with which the industry must comply. It is written primarily for those owners/operators of facilities that are generators of RCRA hazardous waste, not facilities that have RCRA permits, are operating under interim status (see permitting discussion in Section 3), or that do not generate hazardous waste at all (some wood preserving facilities use chemicals in their processes that do not generate hazardous waste). The following information is contained in this Guide:

- Size and geographic distribution of wood preserving facilities in the United States
- General overview of RCRA requirements

- Types of wastes generated at wood preserving facilities
- Environmental compliance concerns relating to drips pads, tanks and sumps, and storage yards at wood preserving facilities
- Additional relevant environmental statutes and regulatory schemes
- Answers to commonly asked questions concerning regulatory requirements
- Names and phone numbers of organizations that can provide additional information.

Potential for Increased State Stringency

It is important to note that State and local restrictions concerning wood preserving facilities may, in fact, be more stringent than Federal regulations. Individual State requirements are not discussed in this Guide, but may be applicable to facilities within that State. Thus, it is imperative that owners/operators of wood preserving facilities seek additional guidance in determining the applicability of more stringent State and local requirements. State authorization issues as they directly apply to the wood preserving industry are discussed in more detail in Section 4 of this Guide.

Using this Guide

In addition to a detailed description of RCRA regulations that apply to the wood preserving industry, this Guide also contains a general summary of other aspects of the Federal RCRA program and its regulations. Readers who have extensive experience with wood preserving facilities may choose to skim over Section 2 (overview of wood preserving industry) and Section 3 (overview of RCRA), and focus on Sections 4 through 7 (wood preserving wastes and regulations applicable to wood preserving facilities).

References to Regulation

The end of each section contains a shaded box with regulatory citations and references to information discussed in that section. Please consult these regulations and other references for a more in-depth discussion of applicable requirements.

Section 2
Overview of the Wood Preserving Industry

Industry Overview

Note: *This section has been included to give State and EPA inspectors at wood preserving facilities a brief overview of the industry. Much of the information presented in this section is common knowledge to members of the wood preserving industry.*

Surface Protection versus Wood Treatment

The purpose of wood preserving, also called wood treatment, is to provide long-term protection from the damaging effects of fungi, insects, and marine borers, thereby extending the usable life of wood products. This is accomplished through the application of an EPA registered preservative solution to timber. Wood treatment is different from surface protection processes in that **surface protection** is characterized by non-pressure applications to the surface of the wood that are designed to provide short-term cosmetic protection against mold and sap stains. **Wood preserving**, on the other hand, involves the penetration of preservative solutions into wood to preserve its structural integrity and improve its resistance to weathering, water, and ground contact. Wood surface protection and wood preserving are often confused since, historically, chlorophenolic formulations were used in both processes. Chlorophenolic formulations are now only used in wood preserving. In addition, while EPA has chosen to specifically identify wastes from the wood preserving industry that use chlorophenolic formulations as hazardous wastes, the Agency also concluded that the regulation of chemicals that are now used in surface protection is not warranted on the Federal level.

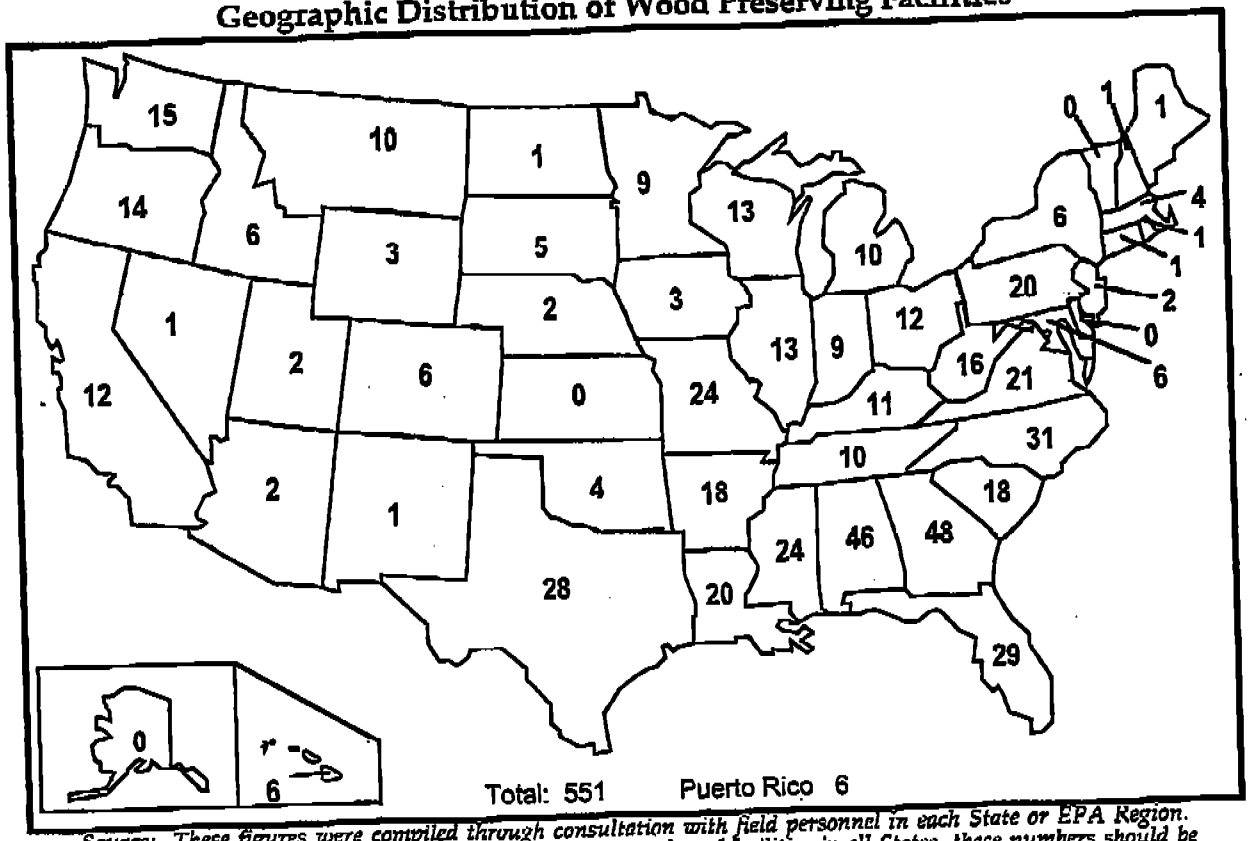
Almost all timber is processed in some way before being sold. The following wood products are normally treated in a preservation process before commercial distribution: dimensional lumber (i.e., lumber that has been cut to a specific shape or size) that will endure prolonged exposure to the ground or weather, railroad ties, telephone poles, telephone

cross arms, bridge beams, fencing, window sills, doors, and pilings.

Geographic Distribution of Wood Preserving

Wood preserving facilities are located in varying numbers in almost every State. As indicated in Exhibit 1, the highest concentration of facilities is in the Southeast and Northwest where there is a ready supply of raw wood. Exhibit 2 illustrates the size of wood preserving operations in the industry.

Exhibit 1
Geographic Distribution of Wood Preserving Facilities



Source: These figures were compiled through consultation with field personnel in each State or EPA Region. Because exhaustive confirmation was not done on the number of facilities in all States, these numbers should be considered estimates.

Exhibit 2
Industry Facility Size Distribution - 1992

Type of Facility	Facilities with 1 to 19 employees	Facilities with 20 to 99 employees	Facilities with 100 or more employees	Total
SIC 2491 - Wood Preserving	307	168	11	486

Source: Based on 1992 Bureau of the Census Data.

According to 1992 census data, of the total of 486 wood preserving facilities, a large portion of them, approximately 63 percent, employed between 1 and 19 people, 34 percent employed between 20 and 99 people, and 2 percent of the facilities employed over 100 people. The bulk of wood preserving facilities are small operations, that are usually supplied with preservative formulation by several larger national chemical companies. The chemical supply companies frequently offer their clients training and guidance on complying with environmental regulations as well as professional services such as hazardous waste management and engineering. There also appears to be a trend in the industry toward larger companies acquiring independent wood preserving companies and operating them as subsidiaries.

Note: *EPA has not attempted to reconcile the Bureau of the Census data with its own facility count. This data is mentioned because it gives a valuable indication of the relative size of wood preserving facilities.*

Wood Preserving Process

The preservation process that is applied to a particular bundle, or charge, of wood varies with the type of wood being treated and any particular product specifications that the wood treater may need to consider (e.g., wood that is used for construction of outdoor structures warrants a higher degree of protection due to prolonged exposure to climatic elements). Wood is porous and each wood preserving process takes advantage of this fact to impregnate the wood with preservative. In most cases, the process begins with a preliminary **conditioning step** that assures a prescribed moisture content in the wood. Less moisture allows more preservative to penetrate and remain in the wood, providing increased protection.

To change the moisture content, a variety of steps can be taken. These include: air or kiln drying; Boulton drying, which consists of pulling a vacuum on the treating cylinder while the wood is immersed in a heated oil-borne solution; or steam conditioning, which consists of heating the wood in the treating cylinder with steam for several hours then rapidly vacuuming the wood to remove moisture. The pressure or treatment cylinder where the preservative is actually applied to the wood is commonly called a **retort**.

After conditioning, preservative solution is applied to the wood. Most facilities use pressurized cylinders (retorts) to apply the preservative solution. This involves placing charges of wood into the retort and applying the preservative under a pressure system until sufficient penetration and retention of the preservative into the wood has occurred. The desired degree of penetration and retention is determined by prescribed product specifications and will dictate how long the pressure is applied. Excess preservative is drawn from the wood through a vacuum system, and pumped back into the process tank, where it will be used again in the same process.

A small percentage of facilities use non-pressurized dip tanks to treat wood. This involves simply lowering the charges into a vat of preservative, usually an oil-borne preservative. The charge is then

allowed to soak in the vat until a predetermined degree of penetration is reached. Penetration is sometimes aided by heating and then cooling the preservative.

There are a number of common pressure processes currently used by the wood preserving industry to treat wood. These include full-cell, modified full-cell, and empty-cell processes. Also, a variety of preservatives are used, which are either water- or oil-borne. The different wood preserving processes and solutions are discussed below.

Oil-Borne Processes

Two primary types of pressure vacuum treatments, empty-cell and full-cell, are used to apply oil-borne preservatives. Examples of oil-borne preservatives include creosote, creosote petroleum mixtures, copper napthenate, and pentachlorophenol. Creosote is commonly used to treat railroad ties, telephone poles, pilings, and bridge beams, while pentachlorophenol is most often mixed into solution with oil to treat telephone poles.

The most widely used process is called **empty-cell.** In this process, the cells of the wood are merely coated with preservative. The empty-cell process obtains deep penetration of preservative and attempts to leave the cell walls of the wood treated, while leaving a minimum of excess preservative in the void spaces of the cells. Because a smaller amount of preservative is used compared to the full-cell processes, the product is lighter and easier to ship. The empty-cell process also results in less expensive treatment costs for the facility since less preservative remains in the wood.

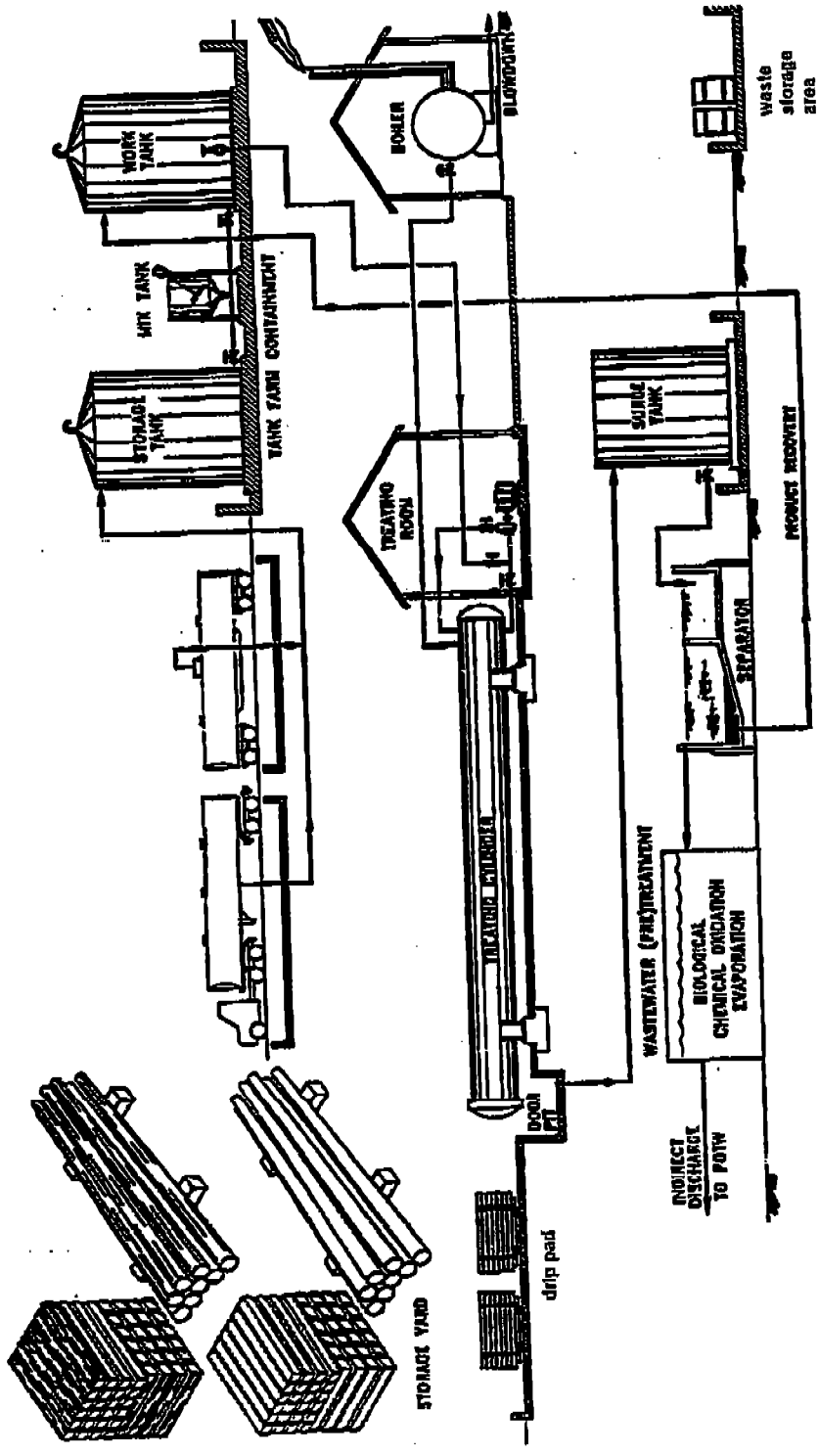
One type of empty-cell process is the **Lowry** process, which entails filling the retort with preservative while maintaining atmospheric pressure. When the retort is filled with preservative, pressure is applied, forcing preservative into the wood. This compresses the air contained in the cells of the wood, allowing preservative to fill the balance of the cell. Once the desired amount of preservative has been injected, usually over the course of several hours, the retort is drained and a final vacuum is applied. During this

last step, much of the preservative in the cells is forced out by the remaining air in the cells of the wood, which expands as it is subjected to the vacuum and then returned to ambient pressure. This vacuum also minimizes drippage after the charge is removed from the retort and is placed onto the drip pad.

The most widely used empty-cell process is the **Rueping** process in which air pressure is applied and maintained in the retort prior to filling the retort with preservative. When the retort is completely filled with preservative, pressure is applied to force the solution into the wood. Once the pressure is released, the retort is drained and the final vacuum is applied. As a result of internal pressure, even more preservative is forced out of the wood than in the Lowry process.

The second type of wood preserving process is called the **full-cell (or Bethell)** process because it results in a higher retention level by nearly filling the wood cells with preservative. In this process, most of the air in the retort is pumped out, creating a strong vacuum which is then held to draw most of the air out of the wood. The retort is then filled with preservative without breaking the vacuum, forcing preservative into the cell spaces that have been created by the evacuated air. When the retort is completely filled with preservative, pressure is applied to force the solution into the wood. Once the pressure is released, the preservative is pumped out of the retort and a final vacuum is drawn to force out excess preservative. When the vacuum is released, much of the remaining surface preservative is drawn back into the wood, reducing the amount of drippage once the charge is taken out of the retort. Exhibit 3 illustrates the oil-borne wood preserving process.

Exhibit 3
Wood Preserving Facility Process Schematic
(oil-borne preservative)

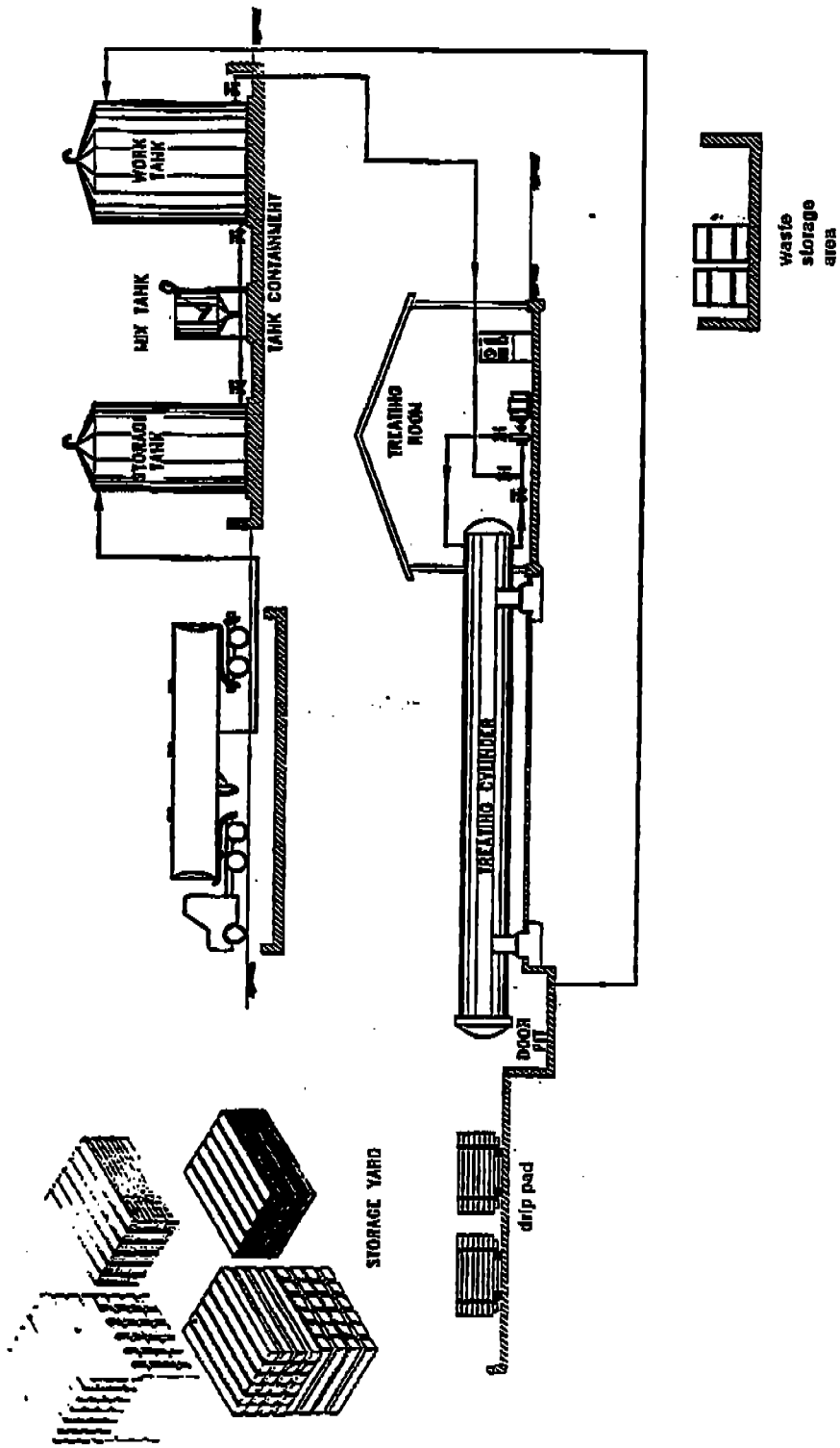


Water-borne Processes

Full-cell and modified full-cell processes are used to apply water-borne preservatives. The full-cell process utilized at water-borne facilities is very similar to that used for oil-borne preservatives. The modified full-cell process applies a weaker, or lower, initial vacuum to retain more air in the cells of the wood. Once the pressure treatment phase is complete, the remaining air (now expanding because pressure has stopped) displaces the preservative which is, in turn, forced out of the wood. By forcing more preservative out of the wood, weight is minimized and subsequent shipping costs are reduced. Exhibit 4 illustrates the water-borne wood preserving processes.

Water-borne preservatives contain active ingredients that are inorganic metal oxides, or less frequently salts, and are commonly used to treat dimensional lumber and telephone poles. This type of preservative includes oxine copper, ammonical copper citrate (CC), copper azole (CBA), copper dimethyldithiocarbomate (CDDC), chromated copper arsenate (CCA), ammonical copper arsenate (ACA), acid copper chromate (ACC), ammonical copper zinc arsenate (ACZA), and ammonical copper quat (ACQ). As this Guide will discuss, wastes that are generated by wood preserving facilities, especially those using creosote, chlorophenolic, or arsenical-based preservatives, have the potential to be considered hazardous waste under RCRA. Wastes commonly generated in the wood preserving industry are discussed in more detail in Section 6 of this Guide.

Exhibit 4
Wood Preserving Facility Process Schematic
(water-borne preservative)



Environmental Concerns Associated with Wood Preserving Wastes

Past mismanagement of toxic chemicals at wood preserving facilities has caused significant contamination of soil and groundwater at some sites. As of May 1996, more than 45 wood preserving sites had been placed on Superfund's National Priorities List (NPL) for priority cleanup of contamination. The majority of contamination has been found at older facilities that operated for many years before current environmental regulations and disposal options existed. Along with other poor waste management practices, contamination is generally caused by excess preservative, called **kickback**, that has been allowed to drip onto the ground from treated charges of wood.

A growing concern over the presence of dioxins and furans in chlorophenolic wastes found at some facilities, coupled with the desire to prevent the release of arsenic into the groundwater, has led EPA to regulate the wood preserving industry under RCRA. In 1990, the first RCRA regulations specifically addressing many wood preserving wastes were published. These standards require owners/operators of many wood preserving operations to comply with RCRA. Subsequently, EPA promulgated rules requiring tighter management of hazardous waste generated by the wood preserving industry. As a result, many facilities in the industry have invested heavily in cleaning up existing contamination and complying with regulatory standards for facility construction and proper waste management.

Health Concerns Associated with Wood Preserving Industry

The primary reason behind RCRA's preservative containment requirements is to keep preservative chemicals out of ground and surface waters. Contamination of soil and groundwater is a serious problem because it can move considerable distances as it is picked up by water moving through the soil and the water table. Because there are few, if any, naturally occurring organisms in the environment that can readily break down these chemicals. Once the contamination enters the ground it has the potential to linger for long periods of time and cause extensive contamination to surrounding subsurface environments.

The wood preservatives creosote, pentachlorophenol, and inorganic arsenicals contain toxic constituents that have the potential to cause skin, eye, and respiratory irritation as well as more serious ailments in humans, if humans are overexposed to them. Some of these constituents have been classified as carcinogens through epidemiological exposure studies on animals. Exposure of aquatic plant and animal life to these toxic constituents has also been found to have adverse effects.

Toxic constituents in wastes generated by the wood preserving industry have been found to have chronic systemic effects on laboratory animals as well as humans and have been determined to be present in sufficient concentrations to pose a substantial threat to human health and the environment. For example, previous studies of pentachlorophenol have shown it to be highly toxic to humans. Exposure to pentachlorophenol can cause contact dermatitis, damage to vision, and upon ingestion, lung, liver, and kidney damage. Inhalation of pentachlorophenol can result in acute poisoning, centering on the circulatory system with possible accompanying heart failure. Other studies have shown pentachlorophenol to be a carcinogen.

One of the most commonly used preservatives in the wood preserving industry is chromated copper arsenate, or CCA. This formulation contains water, arsenic acid, chromic acid, and copper oxide. Overexposure to CCA can damage mucous membranes and tissues of the respiratory system and cause chemical burns on the skin and even skin lesions. Ingestion of large amounts of CCA may have more serious effects. Chronic exposure to significant doses of the chemical components of CAA can lead to mental confusion, loss of coordination, and impaired senses of touch, pain, and temperature. CCA is also considered a possible carcinogen.

From this data, it is clear that many of the chemicals used in the wood preserving industry have the potential to threaten human health when handled in an unsafe manner. As a result, it is crucial that plant employees, and anyone else coming into contact with

preservative solutions containing these constituents, be extremely cautious when handling the chemicals. Some recommended precautions are discussed below.

Health Precautions for Plant Personnel

In order to minimize exposure to wood preserving chemicals, operators of wood treatment equipment should closely follow company policy and all applicable Federal, State, and local regulations concerning use and management of those chemicals. At a minimum, facility personnel should:

- Use preservatives in accordance with the EPA approved manufacturer's label.
- Follow pesticide label and Occupational Safety and Health Act (OSHA) requirements for personal protective equipment.
- Avoid direct contact with the chemicals by wearing protective gloves and washing hands and other exposed skin before eating, using tobacco products, or using the rest room.
- Enter the retort or other confined space only in accordance with an OSHA confined space entry plan.
- Wear a respirator in process areas at inorganic arsenial wood treating plants, unless PEL air monitoring has demonstrated that it is safe not to wear one.

Additional information is available on the subjects discussed above:

For more information on the wood preserving process, consult The Preservation of Wood, A Self Study Manual for Wood Treatment. Revised by F. Thomas Milton, University of Minnesota, College of Natural Resources, Department of Forest Products, 1994.

Preservative Treatment of Wood by Pressure Methods. ID, McLean, USDA Agriculture handbook, No. 4D, December 1952 (Reprinted with corrections September 1960).

Wood as an Engineering Material: Wood Handbook, Chapters 17-19. USDA Agriculture Handbook, No. 72, Revised 1974.

Wood Deterioration and its Prevention by Preservative Treatment. Darrel D. Nicholas, editor, with the assistance of Wesley E. Loos, Syracuse University Press, 1973 (two volumes).