WOOD TREATMENT THE CANADIAN PERSPECTIVE

WHAT IS WOOD TREATMENT?

Wood can be treated to preserve its structural integrity, extend its lifetime, and protect its appearance by two different methods. Wood preservation involves impregnating wood with pesticides to provide long-term resistance to organisms that cause deterioration. On the other hand, wood protection is achieved by treating wood surfaces to prevent sapstains, or surface discoloration, also caused by living organisms, which reduce wood's aesthetic appeal and value. Home owners also apply wood treatment chemicals to fence posts, decks, patio furniture, etc. to prolong the life of wood products exposed to the elements.

HOW DOES WOOD DETERIORATE?

Fungi and other organisms attack wood, breaking down its cellular structure and weakening the wood. Fungi cause decay, sapstains and soft-rot. Termites feed on wood; carpenter ants bore channels and nest in dead wood; and the larvae of the powderpost beetle burrow into wood and emerge several years later as adults, after causing internal damage to the wood.

The rate of fungus growth depends on temperature, available oxygen, wood moisture content, and the nature of the wood itself. Continuously damp wood will not last long. Untreated timbers used in mines may have a life span of less than two years. Marine borers can destroy an untreated dock piling in less than one year.

Treating wood with chemicals which are toxic to attacking organisms extends the lifetime of wood, but it also necessitates careful administration and control of these chemicals to prevent negative impacts on humans and the environment.

WHAT CHEMICALS ARE USED FOR WOOD TREATMENT?

The intended use of a wood product, the type of wood treated, the comparative cost, aesthetic effects, safety and properties of the chemical applied, and government regulations determine which pesticide is most appropriate. The chemical must be toxic to the organisms present, be able to penetrate the wood, be chemically stable, safe and economical to use, and not weaken the wood or pose an unreasonable threat to plant, animal or human life. In Canada, the registered chemicals most often used for wood preservation are pentachlorophenol (PCP), creosote, chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA). Major chemicals used commercially for wood protection in Canada include: sodium tetra and pentachlorophenate, copper-8-quinolinolate (Cu-8), and 2-(thiocyanomethylthio) benzothiazole

(TCMTB). Several other wood protection chemicals are now under review.

Other wood treatment chemicals registered in Canada, but less frequently encountered include bis(tributyltin) oxide (brushed on cut ends of pressure treated lumber and in marine paints), copper and zinc naphthenate (used as surface treatment on cut ends), metam-sodium and chloropicrin (injected into standing posts and poles).

The following table lists typical uses of the most common wood treatment pesticides:

Pesticide	Typical Use
CCA (chromated cooper arsenate)	fence posts, lumber for patio and landscape use, foundation lumber, plywood, shingles and shakes, and siding.
ACA (ammoniacal copper arsenate)	utility poles, fence posts, construction and landscaping timbers.
PCP (pentachlorophenol)	railroad ties, utility poles, exterior paints and stains, construction timbers and posts.
Creosote	railroad ties, marine pilings and timber, other construction timbers.
Chlorophenates, CU-8, TCMTB	structural lumber for export.

HOW ARE WOOD TREATMENT CHEMICALS APPLIED?

Wood treatment chemicals are not used in their pure state, but are usually diluted with water or an organic solvent. Detergents and other chemicals are sometimes used to help dissolve the pesticide and stabilize the solution.

The wood treatment chemical can then be applied in the following ways:

- Pressure Treatment Performed at commercial treatment plants, pressure treatment uses high pressure to force the preservative into wood. It is one of the most effective wood treatment methods, and is used for longterm preservation where severe decay conditions exist.
- Soaking and Thermal Treatment This consists of soaking dried wood in chemical preservatives for periods up to several days, but seldom less than 24 hours. A hot and cold bath method accelerates the rate of absorption. Dried wood is soaked in a hot preservative solution for two to ten hours, then transferred to a cold solution for one to six hours.
- Surface Application: Wood surfaces can be treated several different ways. Commercial operations can spray or dip lumber to control sapstains, while home applicators can use a paint brush. Surface treatment is inadequate for severe decay conditions.
- Treatment of Standing Poles, Posts and Beams.
- Treating wood already in place presents special problems. Poles are most susceptible to decay near the ground-line. To prevent decay a "ground-line bandage" can be prepared with pentachlorophenol and grease and wrapped around the post. Alternately, chloropicrin or metam-sodium can be injected into drilled holes which are then plugged with dowels.

ARE WOOD TREATMENT CHEMICALS SAFE?

Wood treatment chemicals are safe if they are handled properly. But because they must remain active for long periods and repel a variety of organisms, they are particularly potent. If improperly used, they can be fatal to humans and animals, and toxic to plants. Chemicals used as solvents, dispersants and surfactants in

formulating wood treatment solutions are also often toxic.

Specific handling and safety procedures should be followed when using, storing, transporting or disposing of wood treatment chemicals. For example, using wood treated with chlorophenols in home interiors and in containers contacting food is unacceptable and illegal. Handling and safety details are available on pesticide container labels and from government occupational, agricultural and environmental agencies. Some handling and safety guidelines and procedures are described below.

WHAT ARE THE HAZARDS OF, AND PRECAUTIONS FOR, HANDLING PRESSURE TREATED (PRESERVED) WOOD?

Inorganic arsenic, pentachlorophenol and creosote penetrate deeply into, and remain locked in the pressure treated wood product. Environmental conditions such as soil temperature, type and acidity may allow small amounts of creosote and pentachlorophenol to move outside the wood. Arsenic residues may also be present in very small quantities on the surface of newly purchased treated wood.

Although the wood preserving industry attempts to reduce such movement and reduce residues as much as is practical, the following precautions should be followed to minimize even further the low risk of handling the pressure treated products.

- wear impermeable gloves when frequent or prolonged contact with non-weathered pressure treated wood is required. Weathering will remove arsenic residues.
- do not burn treated lumber without a permit
- do not use pressure treated lumber for surfaces used for food or feed preparation and direct or indirect drinking water containers.
- wear a dust filter mask and goggles when cutting treated wood products to avoid prolonged inhalation of sawdust and to protect the eyes from injury.
- do not use pressure treated lumber for construction of beehives or containers for animal feed or silage storage.
- CM treated lumber may be used indoors if a sealant is applied.
- PCP and creosote treated wood should not be used indoors.

Consult local suppliers, manufacturers, or appropriate government agencies for further information.

WHAT ARE THE HUMAN HEALTH HAZARDS?

Wood treatment chemicals can enter the body and cause both short and long term effects. The severity depends on the dosage received the route of exposure and the individual's characteristics, such as age and body weight.

The possible short- and long-term health effects of each pesticide used in wood treatment is listed below. Consumers purchasing treated wood should note that these health hazards apply more to industrial pesticide applicators, who have the potential of receiving greater exposures to wood treatment chemicals. However, the consumer should be aware of safe handling requirements for wood treatment chemicals labeled "domestic", which are described on the product labels. Further detailed information is available from the Council of Forest Industries of B.C., governmental environmental agencies, the Ontario Ministry of Labour, Agriculture Canada and pesticide companies.

- chromated copper arsenate (CCA) and ammoniacal copper arsenate (ACA) - although low levels of

chromium, copper, and arsenic occur naturally in food, they are dangerous at higher concentrations. The known effects of ACA and CCA include skin irritation and nausea from short-term exposure, and death may occur following ingestion. Liver and kidney damage can arise from long-term exposure.

- pentachlorophenol and chiorophenates - short. term exposure can result in skin, eye and upper respiratory system irritation; long-term exposure can cause weight loss and damage to internal organs and the nervous system. Long-term skin exposure or ingestion can be fatal.
- creosote - a coal derivative and suspected carcinogen, creosote can cause skin and eye irritation, sweating, nausea and subsequent convulsions or coma, from repeated or prolonged contact, and if ingested in high concentrations, death.
- 2-(thiocyanomethylthio) benzothiazole (TCMTB) and copper-8-quinolinolate (Cu-8) - little health impact assessment has been done. TCMTB can cause skin and eye irritation if it is improperly handled.

WHAT ARE THE ENVIRONMENTAL HAZARDS?

Many wood treatment chemicals, such as chlorophenols, TCMTB, and Cu-8, are very toxic to fish. Chlorophenols have been shown to adversely affect fish reproduction and growth. Bis(tributyltin) oxide is particularly hazardous in the marine environment, being toxic at extremely low levels. Some other properties of these chemicals, such as persistence and bioaccumulation, add concerns in addition to their toxicity:

Persistence: some chemicals, such as pentachlorophenol and components of creosote resist breakdown and can remain in the environment for years.

Bioaccumulation: once absorbed, certain wood treatment chemicals are not readily excreted, and build up in the body. Pentachlorophenol and some creosote components are examples of bioaccumulative substances.

Biomagnification: some chemicals become more concentrated as they pass from prey to predator in the food chain.

Governments permit low-level discharges of chemicals, which have minimal and identified impact, into air and water bodies. But of greater consequence is the possibility of accidental contamination through spills, fires and leaching of chemicals from treated wood products. A particularly serious problem, discovered by Environment Canada, is the leaching of chlorophenates from treated lumber during rainfall, producing contaminated runoff which can be acutely toxic to fish. Contaminated runoff is also believed partly responsible for the presence of chlorinated dioxins, chiorophenols and chiorophenates in marine animals.

Chlorinated dioxins and furans, found as trace impurities in chiorophenates and chiorophenois, can be toxic even at very low concentrations, and are perceived as an important environmental problem in Canada. For example, improper burning of chlorophenol or chiorophenate wastes produces chlorinated dioxins and furans. A fact sheet entitled "Dioxins and Furans," available from CCME and government environmental agencies, contains more information.

Wood treatment plants sometimes contaminate soil and groundwater through spills or poor housekeeping. Sites contaminated with creosote, chlorophenol and heavy metals can require clean-up operations costing millions of dollars.

WHAT ARE GOVERNMENTS DOING?

Extensive federal and provincial government resources are dedicated to creating a legal and technical climate in which these chemicals can be used and disposed of safely. Activities in this area include the registration and control of the composition, use, packaging, labeling, transport, handling, storage and disposal of wood treatment chemicals. Human health and environmental impacts and requirements are also addressed. Under the sponsorship of the Canadian Council of Ministers of the Environment (CCME), a variety of initiatives on wood treatment chemicals are underway. For example, the Dioxin Advisory Committee is reviewing the ways in which environmental dioxin contamination can be reduced by better controlling the discharge and disposal of chlorophenols, which are contaminated with dioxins. The Waste Management Committee Is addressing industrial sites contaminated with wood treatment chemicals, and the Air Advisory Committee is considering guidelines for acceptable levels of certain wood treatment chemicals in air. CCME is also represented on the National Joint Consultative Committee of Senior Health and Environment Officials, which is also developing guidelines for acceptable levels of human exposure to various components of wood treatment chemicals.

WHERE CAN I FIND OUT MORE?

A partial list of available government publications on wood treatment chemicals is provided below. For further information, contact your local library or nearest Provincial or Federal Government Environment office.

Environment Canada. Chiorophenols and their impurities in the Canadian environment, EPS, 3-EC-81-2, 1981. Environment Canada.
Chiorophenols and their impurities in the Canadian environment, 1983 supplement, EPS 3-E P-84-3, 1984.
Environment Canada and British Columbia Ministry of Environment. Chiorophenate wood protection. Recommendations for design and operation, 1983.
Environment Canada. CCA wood preservation facilities. Recommendations for design and operation, EPS 2/WP/3, 1988.
Environment Canada. ACA wood preservation facilities. Recommendations for design and operation, EPS 2/WP/4, 1988.
Environment Canada. Creosote wood preservation facilities. Recommendations for design and operation, EPS 2/WP/1, 1988. Environment Canada. PCP thermal treatment facilities. Recommendations for design and operation, EPS 2/WP/5, 1988. Environment Canada. PCP wood preservation facilities. Recommendations for design and operation, EPS 2/WP/2, 1988.
Environment Canada. Chlorophenate wood protection. Hazards and controls (undated fact sheet).
Environment Canada. Assessment of storm water related chlorophenol releases from wood protection facilities in British Columbia, Conservation and Protection Regional Program Report 87-14,1987.
Forest Industry Industrial Health Research Program. Handling manuals and reviews of properties, uses, and health hazards of chemicals used in the wood treatment industry, 1982-87.
Ontario Ministry of Labour and McMaster University. Occupational Health Program Division. Health effects of coal tar products and bitumen, undated.

This fact sheet is published under the auspices of the Canadian Council of Ministers of the Environment. Additional copies are available from provincial and federal environment offices.

This publication has been prepared by the Canadian Council of Ministers of the Environment (CCME) to present the facts on wood treatment from a Canadian perspective. It includes information about the nature,

use, regulation and impacts of pesticides used for this purpose.

Hard copies of this document are available from CCME Documents, fax 204-945-7172 or e-mail: bangus@chc.gov.mb.ca.

Note: Hard copy orders will be limited to a maximum of five (5) brochurces of each title.

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