Pest Management Plan

For BC Hydro Wood Structure Maintenance

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BC hydro

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Executive Summary

About the PMP

The Wood Structure Pest Management Plan (PMP) legally authorizes BC Hydro to use wood preservatives to control wood pests and preserve its woodpoles, as well as other wood structures on Hydro-owned or leased property. BC Hydro maintains approximately 900,000 woodpoles on its distribution lines. This PMP replaces existing Pesticide Use Permits and Service License Endorsements for use of wood preservatives, as per the *Pesticide Control Act*.

The purpose of the PMP is to describe the integrated pest management program (IPM) for controlling pests or reducing pest damage to BC Hydro wood structures. IPM is a decision-making process that uses a combination of techniques to effectively suppress pests, while maintaining social and environmental values.

Pest species to be controlled under this PMP are ants, termites, wood-boring insects, and wood-decaying fungi. The primary methods used to control them are external or internal wood preservatives, stubbing, pole-top repair, and replacement of woodpoles.

Woodpole Test & Treat Program

BC Hydro's Remedial Woodpole Test & Treat Program inspects woodpoles and uses wood preservatives to maintain and prolong the life of woodpoles. Poles are treated to prevent decay from wood rot or structural damage from insects, which can lead to reduced public and worker safety, pole failure, and increased service outages. BC Hydro must use wood preservatives for safety and liability reasons.

In addition, the financial cost of *not* treating woodpoles is significantly greater than the cost of treating them. The use of wood preservatives reduces the number of trees that need to be harvested and extends the service life of woodpoles.

BC Hydro is an industry leader in the field of woodpole treatment and responsible use of wood preservatives. Over the last 30 years, our Test & Treat program has incorporated new wood preservatives that are safer for the environment. BC Hydro's research program carries out studies and other initiatives to find the most effective and environmentally-responsible treatments.

Only certified pesticide applicators are permitted to handle and apply wood preservatives. Certified applicators must adhere to all legislation, standards, and safety requirements. In addition, before applicators are authorized by BC

Hydro to apply wood preservatives, they must complete at least 800 hours of onsite work experience and a BC Hydro examination program.

Environment and Safety Issues

BC Hydro recognizes the vital physical and ecological roles fulfilled by aquatic, marine, riparian and other ecosystems and recognizes the importance of protecting these systems to ensure their long-term sustainability.

BC Hydro has established No Treatment Zones (NTZs) where specific wood preservatives may not be applied. An NTZ is defined as the distance between the edge of a water source or waterbody and the closest allowable point of application of a specific wood preservative. Multiple NTZs may apply at a given location depending on the numbers and types of preservatives used.

The use of remedial wood preservatives on wood structures does not harm the environment or wildlife, because most preservatives used are of low to moderate toxicity and products are placed carefully inside the pole or sealed securely against the pole below the groundline. Therefore, neither the public nor wildlife will normally come into contact with the wood preservatives.

Research has shown that wood preservatives leach very little outside woodpoles, usually not at all. Wood preservatives tend to bind to the wood, reducing the risk of leaching. They also are not released into the atmosphere, and none of the products used are ozone-depleting.

Because BC Hydro uses only certified pesticide applicators, there is little risk of misapplication, over-application, or spillage of wood preservatives. All applicators carry spill kits and other protective equipment with them. When used properly, wood preservatives pose no hazard to eyes, skin, or lungs.

IPM Steps

BC Hydro's Remedial Woodpole Test & Treat Program follows integrated pest management (IPM) principles. These are reflected in the following steps, which are described in detail in this PMP:

1. Prevent woodpole deterioration (through inspection and maintenance procedures).
2. Implement maintenance cycles (for optimal timing and scheduling).
3. Notify public and consult with First Nations on planned treatments.
4. Inspect woodpoles.
5. Identify pests to be treated.
6. Determine action and select treatment methods.
7. Treat (and inspect contract work).
8. Evaluate to measure success of treatment.

9. Report on wood preservative use.

Chapter 1
Ensuring a Safe Power Supply

1.1 BC Hydro Commitments

BC Hydro carries out a woodpole Test & Treat program as part of its mission to ensure a safe and reliable power supply system, while respecting the environment, and optimizing program values.

To minimize the impact on the natural environment, Hydro staff must adhere strictly to corporate and government rules and regulations. Corporate policy stresses the need for being pro-active in the protection of the environment. Therefore, Hydro will actively pursue opportunities to manage resources for the benefit of present and future generations at all stages of its operation.

1.2 Role of PMP

The Wood Structure Pest Management Plan (PMP) authorizes BC Hydro to use wood preservatives to control wood pests and preserve wood structures at any BC Hydro facility, as well as areas where BC Hydro has wooden structures—in particular, poles on powerline corridors. Once approved by the Ministry of Water, Land and Air Protection (MWLAP), the PMP will replace Pesticide Use Permits for wood preservatives, as well as Service License Endorsements. The term of the PMP will be five years.

The PMP is divided into several chapters, mostly dealing with treatment of woodpoles. Chapter 6 covers treatment of other wood structures.

1.3 Reasons for Conducting Pest Management

Various pest species can interfere with and damage woodpoles and wood structures, shortening their service life. The main pests to be controlled under this PMP are:

- ants
- termites
- other wood-boring insects
- wood-decaying fungi

Remedial wood preservatives are used to protect untreated wood surfaces where it is important to prevent decay from wood rot or damage from wood-boring insects that leads to structural weakening.

Decay and weakening of poles can lead to reduced public and worker safety, pole failure, and increased service outages. Electrocution from powerlines

almost always leads to severely disabling injuries or death. Therefore, BC Hydro must use wood preservatives for safety and liability reasons.

The use of wood preservatives also limits the number of trees that need to be harvested, and extends the service life of woodpoles. This promotes the efficient use of trees and reduces the potential waste of this important resource. It also means woodpole use represents a sustainable use, since it takes at least 100 years to grow a tree suitable for a woodpole. Less frequent replacement of poles reduces the environmental impacts associated with replacing poles, such as digging in sensitive areas.

BC Hydro will use the principles of integrated pest management to control wood rot and wood pests. IPM is a decision-making process that uses a combination of techniques to suppress pests, while incorporating social, environmental, and other values.

BC Hydro uses the following control methods and wood preservatives, described in this PMP:

- external, below ground preservative treatment (bandages using copper as an active ingredient, usually with sodium fluoride or borax; zinc naphthenate or copper naphthenate as a surface treatment)
- internal liquid preservative treatment (metam sodium fumigant; disodium octaborate tetrahydrate for insect control)
- internal solid preservative treatment (solid rods of boron, sometimes using sodium fluoride or copper)
- stubbing (non-chemical method)
- pole-top repair (preventive, non-chemical method)
- replacing woodpoles (preventive, non-chemical method)

1.4 Woodpole Test & Treat Program

The purpose of BC Hydro's Remedial Woodpole Test & Treat Program is to maintain and prolong the life of woodpoles used on distribution lines. BC Hydro's woodpole program is a leader in its field, one of the most well-respected and well-developed programs in North America.

Woodpoles are usually pressure-treated with a wood preservative prior to installation in order to extend their service life. The groundline region of a woodpole (below ground, at ground or up to 1.3m from the ground) is prone to fungal and insect attack, so it requires re-treatment after a number of years in service as the wood naturally degrades, along with the wood preservatives. Wood preservatives extend pole life, reduce replacement costs and service outages, ensure public and worker safety, and save trees.

Woodpole Life Cycle

Hydro uses an integrated "cradle to grave" approach to pole selection, handling, maintenance, replacement, and disposal.

- Strict purchasing and quality control requirements are followed. BC Hydro requires that all purchased poles have wood preservatives applied in a pressure vacuum. This enhanced preservation process results in a much cleaner product. In addition, all new poles are subjected to a thermal process to “fix” the chemical treatment in the wood. This process ensures that the treatment poses no threat to the environment.

- Lodgepole pine poles are sterilized before or after treatment, by either dry-kilning or heating them in a steam tunnel to prolong their service life. The specified minimum time and temperature ensures that any wood-decaying fungi or insects present in the trees when harvested are killed, so they do not continue to attack the woodpoles once they are in service.

- Procedures are designed to minimize damage to poles during transport, handling and storage, ensuring maximum durability.

- Poles are stored and monitored to ensure that wood preservatives are not released into the environment.

- Pole installation is governed by federal and provincial legislation and BC Hydro standards and guidelines, which ensure that environmental concerns are considered when poles are installed.

- All woodpoles are maintained according to strict maintenance standards, and maintenance records are kept for all in-service poles.

- The service life of poles is prolonged by installing wooden or steel reinforcement (stubs) on poles that have decayed below ground, and by removing deteriorated pole tops and installing pole top extensions where needed.

- Disposal of poles is governed by Hydro’s *T&D Out-of-Service Pole Guidelines and Procedures*.

- Many poles that cannot be reused are donated to BC Wood Recycling, where the treated sapwood is removed and the poles are turned into fenceposts, Adirondack chairs, picnic tables, dimensional lumber, and other products. (The same plant also handles TELUS poles.) The recycling plant has reduced the volume of wood going to landfills by 35%.

- Research to improve the Test & Treat program is ongoing, such as monitoring the market for new pole types and better and improved treatment products, obtaining the most recent literature on the behaviour of wood preservatives in woodpoles, attending industry workshops regularly, and completing a literature review to confirm the extent of migration of wood preservatives.

Cost-Benefit Analysis

The cost of *not* treating woodpoles is significantly greater than the cost of treating them. Cost savings realized by the Test & Treat program help maintain economical electricity rates for the public. Table 1 compares the costs and consequences of not treating versus treating.

Table 1: Costs of Treating vs. Not Treating Woodpoles

	No Treatment	With Treatment
Total Number of Woodpoles	900,000	900,000
Average Service Life	30 years	60 years
Annual Replacements*	12,000	6,000
Replacement and Disposal: Cost per Pole	$ 3,000	$ 3,000
Annual Cost of Ownership	$ 36,000,000	$ 18,000,000
Inspection and Remedial Treatment Cost per Year	$ 1,500,000**	$ 2,500,000***
Total Annual Cost	$ 37,500,000	$ 20,500,000
Annual Net Savings	----------	$ 17,000,000
Annual Trees Saved from Harvest	----------	6,000
Net Treatment Cost	----------	$ 1,000,000
Net Benefit	----------	$ 16,000,000
Cost/Benefit Ratio	----------	0.0625

* Replaced under Maintenance Programs (additional aging poles are replaced during system upgrades and plant re-locations).
** Estimate cost for inspecting but not treating.
*** Historical Test and Treat average program cost

Why Does Hydro Use Wood?

Hydro has evaluated alternate pole materials, including concrete, steel, laminated wood, and composite fibreglass. However, there are some limitations to the use of these alternate poles, including high costs, high risk of damage, environmental impacts, safety risks, and special training requirements to use the alternates effectively and dependably.

Wood is used for poles because it is widely available, has the lowest cost, and is more practical to climb (for inspection and maintenance). Woodpoles

are a proven product, produced and manufactured locally, and derived from a renewable resource.

Preventive Benefits

Pole inspection and remedial treatment greatly increases the in-service life of the woodpole. There are important preventive benefits:

- By extending in-service pole life, energy can be conserved and environmental impacts reduced. The heavy equipment used to harvest, produce, preserve, transport, and install new poles consumes fossil fuel and energy. Pole maintenance operations use small vehicles and hand tools. The net effect is less need of fossil fuel and energy to maintain rather than replace in-service poles.
- Prolonging pole service life reduces the need for disposal of treated poles and associated hardware.

Benchmarking

BC Hydro's woodpole Test & Treat program stands up well in comparison to other utilities—Hydro is a leader in the field.

- In 1994, Hydro implemented a contractor certification program, among the first of its kind in North America. The program was put in place to ensure that contractors understand their responsibilities and follow the most environmentally acceptable procedures.
- BC Hydro, like a few other leading utilities, started its own research lab (Powertech Labs, now a subsidiary of BC Hydro). Powertech has become recognized for its work on researching and evaluating woodpoles and wood preservatives.
- Hydro has recorded and built up significant historical information on woodpoles over the years. While some utilities just replace woodpoles as they fail, Hydro's comprehensive Test & Treat program ensures low failure rates of poles and long pole life.
- BC Hydro was among the first utilities to start using diagnostic tools such as the resistograph (an instrument used for measuring shell thickness).
- BC Hydro was the first Canadian utility to place a moratorium on the use of pentachlorophenol, in 1990.
- Many other utilities do not use the full-length preservative fixation process that Hydro requires for newly purchased poles.
- BC Hydro has detailed written guidelines for the proper handling, re-using, and disposal of woodpoles removed from service (*T&D Out-of-Service Pole Guidelines and Procedures).* These guidelines ensure that risks to people and the environment are minimized. Sound management

of out-of-service poles also reduces costs and liabilities from both environmental and legal perspectives.

Chapter 2
About the Wood Structure PMP

This chapter covers:

2.1 What is a Pest Management Plan?

BC Hydro's **Wood Structure Pest Management Plan (PMP)** consists of two components—this document and the Pesticide Use Standards System website. Because Hydro has other PMPs that deal with the handling of pesticides, aspects common to all of them for the handling of pesticides have been incorporated into an online system. This PMP describes:

- the program for controlling pests or reducing pest damage to BC Hydro wood structures, using the principles of integrated pest management (this document)
- the process for planning, selecting, using, and evaluating control methods within that program (this document)
- the methods for handling, preparing, mixing, applying, and otherwise using wood preservatives within that program (online Pesticide Use Standards System)

This PMP, with a current approval document, will be BC Hydro's legal authority to use wood preservatives on any wood structure at its facilities or on private, Crown, or federal lands, where BC Hydro has legal control or has the permission of the owner/occupier to undertake woodpole maintenance.

The PMP is for the use of BC Hydro staff and contractors when carrying out pest management work on wood structures. It may also be used by other

organizations and the public to identify special interest areas and provide input into finalizing the plan.

2.2 Definitions

A **Pest** is any undesirable organism that must be controlled to ensure the safety and integrity of operating systems. For BC Hydro wood structures, this means primarily wood-destroying insects and fungi.

Wood preservation means to preserve the usefulness and structural strength of wood and wood products by chemical treatment to repel harmful parasitic organisms.

Wood preservatives are chemicals that are applied to the surface or interior of wood to protect it against both insect and fungal damage.

"Integrated pest management" (IPM) is a decision-making process that uses a combination of techniques to suppress pests and that must include, but is not limited to, the following elements:

- planning and managing ecosystems to prevent organisms from becoming pests
- identifying potential pest problems
- monitoring populations of pests and beneficial organisms, pest damage, and environmental conditions
- determining injury thresholds (action levels) in making treatment decisions
- reducing pests to tolerable levels using control techniques
- evaluating the effectiveness of treatments

2.3 Purpose and Objectives

The Wood Structure Pest Management Plan authorizes the use of wood preservatives to preserve BC Hydro woodpoles, and to a lesser extent, other wood structures. Wood preservative applications help control internal and external wood rot and wood-boring insects, thereby considerably extending the service life of woodpoles, which are costly to replace.

The PMP is required to ensure:

- legal accountability (meeting requirements of the *Pesticide Control Act*)

- public awareness of, and input into, Hydro's pest management activities in the context of IPM
- effective, cost-efficient pest control on BC Hydro wood structures
- responsible use of wood preservatives

Objectives

Objectives for pest management of BC Hydro wood structures are based on operating and engineering requirements. Fungi, insects, and other pests that attack wood structures interfere with these requirements. Therefore, when performing wood structure maintenance, BC Hydro will:

- manage pests in and around wood structures in a professional manner
- maintain a reliable supply of electricity
- ensure safe working conditions and public safety
- protect environmental resources
- protect community and social values
- reduce long-term program costs

2.4 Legal Scope of PMP

Under recent changes to the *Pesticide Control Act*, the use of wood preservatives on public land and for public utility purposes can be conducted under a Pesticide Use Permit or Pest Management Plan.

This PMP replaces existing Pesticide Use Permits and Service License Endorsements for use of wood preservatives. It will serve as a more comprehensive and efficient way of describing wood preservative use. PMPs can cover a wider area than permits, are valid for a longer period of time, and help reduce administrative workload; thereby streamlining the approval process.

Recording and reporting of wood preservative use under the *Pesticide Control Act* will continue. Also, Special Use Permits are still required for the use of wood preservatives within research and development programs.

If there is a violation of any section of this plan, penalties will apply only to that line of Hydro business (distribution, generation, substations, non-electrical). In addition, violations of the woodpole Test & Treat program in Generation will be treated separately from violations of the same program in Distribution. In addition, if there is a violation of the plan in one geographical region, penalties will apply only to that geographical region, with the program continuing in other regions.

The PMP is approved by the Deputy Administrator at the Ministry of Water, Land and Air Protection. A BC Hydro representative with signing authority must submit the PMP to the Ministry for approval.

Amendments / Notification

All amendments to the PMP will be signed by a BC Hydro representative with signing authority. Amendments must be submitted to the Deputy Administrator at the Ministry of Water, Land and Air Protection for approval. Amendments may be made to the plan on an annual basis.

The addition of new application techniques, structures, or similar basic changes will not require public or First Nations consultation. However, MWLAP reserves the right to require public advertising and/or First Nations consultation to add a new remedial wood preservative active ingredient.

BC Hydro will meet with MWLAP once a year to review and discuss the PMP, proposed treatment programs, public comments, results of the previous year's program, or other items that need to be considered and possibly incorporated into the PMP. This meeting will replace the annual written notification of intent to treat. However, MWLAP's Deputy Administrator can at his/her discretion require Notices of Intent to treat.

To satisfy posting requirements, a copy of the approved PMP will be available through BC Hydro regional offices. Information on the administration of the PMP and where to locate it on BC Hydro's Intranet will be supplied to offices with customer service facilities. These offices may give out printed copies of the PMP to anyone who requests one.

Reporting

Accurate, up-to-date records allow BC Hydro and the *Pesticide Control Act* administrator to keep track of the quantity of wood preservatives used, and to ensure compliance with legislation.

- Record keeping must be done according to the *Pesticide Control Act* (external link) and regulations.
- Quantity of wood preservative used for woodpole maintenance is captured in the field by using *Daily Operations Records*. Completed files must be forwarded at the end of each contract to the BC Hydro representative. Details on reporting are contained in *Reporting and Record-Keeping* (Pesticide Use Standards system), and in the woodpole standards ES 64-B-07.06, *Pesticide Use Reporting Forms* (Hydro Intranet link) and ES 64-B-07.11, *Maintenance and Management System* (Hydro Intranet link).
- *Daily Operations Records* must also be completed for ad hoc brush-on preservative treatments.
- For each contract, the contractor generates an internal *Woodpole Pesticide Use Follow-up Report*, which must be submitted to the Pest Management Biologist each year by November 30.

- BC Hydro will generate one *Annual Summary of Pesticide Use* (Pesticide Use Standards) for all wood preservative applications in the entire PMP area over the previous year and will submit it to MWLAP.

- BC Hydro will keep *Daily Operations Records* and *Pesticide Use Follow-up Reports* available for inspection by MWLAP for a minimum of three years from the date of pesticide use.

- Hydro's woodpole staff will enter records for Distribution poles into Hydro's master asset management database . The database contains a record of every Hydro distribution pole in BC, including the year the pole was set, initial treatment, wood species, and the type and the date of maintenance activities performed.

Applicable Legislation

All legislation, regulations, and standards pertaining to wood preservative use will be strictly adhered to by anyone working with wood preservatives on BC Hydro wood structures. Legislation that may pertain to wood structure maintenance includes (these are external links to the Acts):

- BC *Hydro & Power Authority Act*
- BC *Pesticide Control Act*
- BC *Waste Management Act* and Regulations, particularly the *Special Waste Regulation* and the *Spill Reporting Regulation*
- BC *Occupational Health & Safety Regulation*
- BC *Worker's Compensation Act*
- BC *Transport of Dangerous Goods Act*
- BC *Wildlife Act*
- Federal *Pest Control Products Act*
- Federal *Transportation of Dangerous Goods Act*
- Federal *Fisheries Act*
- Federal Canada Water Act
- Workplace Hazardous Materials Information System (search on keyword "WHMIS")

Summaries of most of these pieces of legislation acts and how they impact woodpole maintenance are contained in the sections on *Federal Legislation* and *Provincial Legislation* in the Pesticide Use Standards System.

Woodpole Maintenance Standards

Utility pole maintenance in BC Hydro is based on BC Hydro's *Woodpole Maintenance Standards*, series # ES-64-B©.

The woodpole standards describe in detail pole maintenance procedures. Summaries of some of the standards are included in this PMP.

The standards include (links go to Hydro Intranet):

- Certification Process – Test and Treat Applicator (ES 64-A-03)
- Woodpole Test and Treat Program—Overview and Policy (ES-64-B-07.01)
- Woodpole Test and Treat Program—Inspection Procedures (ES-64-B-07.02)
- Woodpole Test and Treat Program—Strength Calculations (ES-64-B-07.03)
- Woodpole Test and Treat Program—Internal Treatment (ES-64-B-07.04)
- Woodpole Test and Treat Program—External Treatment (ES-64-B-07.05)
- Woodpole Test and Treat Program —Pesticide Use Reporting Forms (ES-64-B-07.06)
- Woodpole Test and Treat Program—Tools and Materials (ES-64-B-07.07)
- Woodpole Test and Treat Program —Preservative Handling (ES-64-B-07.08)
- Woodpole Test and Treat Program—Glossary and List of Abbreviations (ES-64-B-07.09)
- Woodpole Test and Treat Program—Maintenance and Management System (ES-64-B-07.11)
- Woodpole Test and Treat Program—Pre-Job and Inspection Guideline (ES-64-B-07.12)
- Woodpole Test and Treat Program—Groundwater Source Identification Process (ES-64-B-07.13)
- Woodpole Test and Treat Program—Basic Process Flowcharts (ES-64-B.07.14)
- Stubbing Woodpoles (ES-64-B-08.01)
- Criteria for Reinforcing or Replacing Woodpoles (ES-64-B-08.03)
- Woodpoles—Pole-top Maintenance & Extension (ES-64-B-08.04)
- Woodpoles—Repairing Woodpecker Damage (ES-64-B-08.05)
- Evaluating Serviceability of Woodpoles Using Resistograph (ES-64-B-08.06)

2.5 PMP Consultation Process

The PMP provides the means to help broaden public awareness and involvement in BC Hydro's pest management programs. Before the PMP is approved by the Ministry of Water, Land and Air Protection (MWLAP), Hydro will carry out its consultation objectives for the PMP process, which are to:

- identify address concerns before the PMP is finalized
- ensure public input into identifying concerns about the PMP and its impact

- foster an overall understanding by the public of the planning process involved with wood structure preservation
- ensure an open and accountable review process

Public Consultation

The public will be encouraged to provide input into the draft PMP.

Hydro's public consultation plan is as follows:

- **Step 1:** Develop a preliminary draft Wood Structure Pest Management Plan (this document) to consolidate all related government and BC Hydro policy, procedure, and information, and as a basis for external discussion.
- **Step 2:** Review the preliminary draft PMP with selected representative stakeholders, including a regional cross-section of local governments, environmental and other interest groups, and selected community representatives. Provide a questionnaire to elicit comments on general and specific aspects of the draft and to allow for open comment. Prepare a consultation report based on comments and questionnaire responses. Incorporate appropriate revisions into a revised draft PMP.
- **Step 3:** Submit the revised final draft PMP and the consultation report to MWLAP. Subject to MWLAP review of the revised final draft PMP, publish newspaper ads in local newspapers advising the public of the draft PMP. Invite stakeholders to view it via hardcopy or BC Hydro's website, and to provide comment. Keep records and logs of all consultations. Incorporate appropriate revisions into the final PMP document.
- **Step 4**: Submit the final PMP, along with a final public consultation report, to MWLAP for final review and approval. The final consultation report is a summary of all consultations conducted with First Nations, the public, other stakeholders, and if requested, members of the Regional Pesticide Review Committee.

All communications will be documented and filed, including letters and results of questionnaires.

First Nations PMP Consultation

First Nations will be encouraged to provide input into the draft PMP. BC Hydro's consultation process with First Nations is as follows:

- **Step 1**: Send an introductory letter to all First Nations that have BC Hydro woodpoles on their reserve lands, inviting their input into the development of the plan.

- **Step 2:** Develop a preliminary draft Wood Structure Pest Management Plan to consolidate all related government and BC Hydro policy, procedure, and information, and as a basis for discussion.

- **Step 3:** Provide a hard copy of the preliminary draft PMP for review to all First Nations that responded (from Step 1). Provide a questionnaire to elicit comments on general and specific aspects of the draft and to allow for open comment. Prepare a consultation report based on comments and questionnaire responses. Consider all comments when revising the draft PMP. Keep records and logs of all consultations.

- **Step 4:** Submit the revised final draft PMP and the consultation report to MWLAP. Subject to MWLAP review of the revised final draft PMP, publish newspaper ads in one or more aboriginal newspapers inviting First Nations to view it via hard copy or on BC Hydro's website, and to provide comment. Respond to all feedback through phone calls, written correspondence or meetings. Consider all comments when preparing the final PMP document.

- **Step 5**: Submit the final PMP, along with a final public consultation report, to MWLAP for final review and approval. The final consultation report is a summary of all consultations conducted with First Nations, the public, other stakeholders, and if requested, members of the Regional Pesticide Review Committee.

- **Step 6:** Upon approval of the PMP by MWLAP, send a copy to participating First Nations.

All communications will be documented and filed, including letters and results of questionnaires.

See later in this PMP for information on First Nations notification and consultation upon program implementation.

2.6 PMP Area and Land Use

This PMP covers BC Hydro woodpoles on all powerline corridors and road frontage areas throughout BC, as well as woodpoles and wood structures on other BC Hydro owned or leased property, including Hydro's generation facilities, electrical facilities, and non-electrical facilities (see Chapter 6).

Woodpoles

BC Hydro maintains approximately 900,000 woodpoles over 54,000 kilometres of distribution lines, passing over private, Crown, and federal lands.

About 90% of Hydro's distribution lines run alongside public road allowances (either underground or above-ground), while the rest are located on public or private lands. Most poles are made of wood, but a few are made of concrete, steel, or fibreglass. Many Hydro distribution poles are used jointly by Hydro, TELUS, and cable companies. All joint use poles are maintained by BC Hydro.

Facilities

BC Hydro also manages hundreds of facilities throughout the province. A BC Hydro facility is a well-defined site, owned or leased by BC Hydro. It usually consists of electrical structures and buildings, and typically has limited public access. Some facilities are non-electrical, such as poleyards, storage yards, and access roads.

For more information, see Chapter 6, which covers the use of wood preservatives at facilities.

2.7 Types of Wood Structures

Only wood structures owned, leased, or maintained by BC Hydro will be treated under this PMP. Most wooden structures are utility poles.

The vast majority of wood preservative use is in the remedial woodpole Test & Treat program. This is Hydro's only established routine maintenance program. The rest of wood preservative use is incidental. For more information, see Chapter 6.

Utility woodpoles — Utility woodpoles are purchased pre-treated and preservative use is for maintenance purposes.

Cross-arms and timbers — Conductors (wires) carrying the electricity from pole to pole are supported by insulators, which are attached to cross-arms. When two or more poles comprise a structure, they are usually connected to each other with one or more timbers to increase strength, stability, or both. Cross-arms and timbers are purchased pre-treated and not usually maintained with wood preservatives.

Pole and other storage racks — Poles are stored on racks (bunks) so they are kept out of contact with the ground and are easy to pick up. Other types of wooden racks exist for storing pipe, wire, etc. These racks are often made of wood and need to be protected from decay.

Woodpole Types Used

Distribution poles may be western red or yellow cedar, lodgepole pine, or other species.

Woodpole Alternatives

Wood is used for poles because it is climbable, widely available, and has the lowest cost. Woodpoles can be climbed with spurs when bucket trucks are not available or practical to use. Conversely, concrete and steel poles cannot be climbed and always require bucket trucks to access. Woodpoles are also a proven product, produced and manufactured locally, and derived from a renewable resource.

Hydro has evaluated alternate pole materials, including concrete, steel, laminated wood, and composite fibreglass. However, there are limitations to the use of these alternate poles:

- Concrete poles are very heavy and cannot be climbed without the insertion of pegs. The presence of pegs makes it possible for members of the public to climb the poles and access the lines creating a significant safety risk. They are also more easily damaged (compared to wood) during transport and installation. These poles require a line truck to service them and special equipment to install them.

- Steel and concrete distribution-class poles are costly (compared to wood distribution class poles), and have a poor life cycle because their manufacturing, transportation, and raw material extraction processes result in substantial environmental impacts, such as burning of fossil fuels.

Hydro does have approximately ten thousand concrete poles in service, purchased in the late 1970's and early 1980's, as well as a hundred steel poles installed as part of a trial. The experience has reinforced Hydro's decision to continue using wood.

Another alternative to woodpoles is burying powerlines. However, it costs five to ten times as much as overhead systems. The use of underground powerlines is also limited by topography and geological features.

Treatment Groups

BC Hydro has three treatment groups of poles in service, categorized by type of initial pre-treatment.

Full-Length Treated Poles

Strict purchasing and quality control requirements are followed. For example, all new poles are chemically treated in a pressure vacuum system. This method of treatment results in a much cleaner product. In addition, all new poles are subjected to a thermal process to "fix" the chemical treatment in the wood. This process ensures that the treatment poses no threat to the environment.

Lodgepole pine poles are sterilized before or after treatment, by either dry-kilning or heating them in a steam tunnel to prolong the service life.

The specified minimum time and temperature ensures that any wood-decaying fungi or insects present in the trees when harvested are killed, so they do not continue to attack the woodpoles once they are in service. Full-length treated poles generally suffer little decay during the first 20–30 years of their life.

Butt Treated Poles

The butt of the pole (from the bottom up to 65 to 130 cm above groundline) is impregnated with an oil-borne preservative using a thermal process. Incising (teeth marks applied to the wood surface) enhances penetration of the preservative. Western red cedar is the only species used for butt treatment. Butt-treated poles were last purchased in 1989.

Butt-treated poles show signs of decay above the treated section, particularly internal decay, earlier than full-length treated poles.

Untreated Poles

Untreated poles were installed pre-1950. In the northern region, locally-produced poles (bush poles) were installed up to the late 1970's. All of these poles have been inspected and preservative bandages have been applied below the groundline.

The species of these poles are western red cedar, hemlock, and lodgepole pine.

Untreated poles have a much shorter life span than the full-length and butt-treated poles. For example, an untreated lodgepole pine pole will begin to decay at the groundline within 5–10 years.

2.8 Wood Preservatives

Only wood preservatives approved by BC Hydro and listed in this PMP are eligible for use for wood preservation under this PMP. Details about the main wood preservatives that BC Hydro uses follow after Table 2.

Table 2: Wood Preservatives Used for Wood Structure PMP

Active ingredient	Trade Name	PCP Number
External Treatment: Paste		
copper naphthenate and sodium fluoride	Cop-R-Plastic (or equivalent)	25708
copper naphthenate	CobraWrap (or equivalent)	23582
copper naphthenate and borax	CuRap 20 (or equivalent)	22083
External Treatment: Brushing Grade		
copper naphthenate	Copper II (or equivalent)	10781
zinc naphthenate	Nuodex (or equivalent)	16845
Internal Treatment: Liquid		
metam sodium (sodium anhydrous)	Guardsman Post and Pole Fumigant (or equivalent)	19343
disodium octaborate tetrahydrate	Tim-bor Professional (or equivalent)	24091
Internal Treatment: Solid		
anhydrous disodium octaborate	Impel Rods II (boron rods) (or equivalent)	23398
anhydrous disodium octaborate, copper, boric acid	CobraRod (copper rods) (or equivalent)	25580

External Treatments

Paste formulations are used as an external, below-ground treatment on the surface of woodpoles, to stop fungi and bacteria. Copper naphthenate may be combined with sodium fluoride or borax for woodpole treatments in bandages. It is applied around poles, from just above the groundline to 55–60 cm below the groundline, in the form of a liquid gel or paste contained within a polymeric pre-made bandage, or applied onto a piece of poly-backed kraft paper. The chemical, which is oil soluble and therefore resistant to leaching by rainfall, is in direct contact with the wood after application and slowly migrates into the outer surface of the woodpole. Unlike the fumigant or boron rod treatment, the copper naphthenate only travels a short distance in the sapwood region of the pole from about 10–50 mm. The treatment is designed to act an as external barrier to prevent fungi from penetrating the wood.

Brushing grade formulations — Copper naphthenate or zinc naphthenate may also be used as surface brushing treatments for wood structures (see Chapter 6).

Internal Treatments

Liquid formulations are used for the internal protection of woodpoles against fungal and insect attack. The fumigant *metam sodium* is applied under low pressure into holes drilled into the pole at the groundline region, into the core of the pole. The holes are then sealed. In the presence of acidic wood and moisture, the chemical forms a gas, *methylisothiocyanate*, the active fungicidal ingredient, which dissipates rapidly through the wood. The fungicide moves vertically above and below the application point (with a small amount of lateral movement), which makes the treatment very effective against internal decay.

The product used to control internal insect problems within woodpoles is Tim-bor Professional. Tim-bor is a water soluble, inorganic borate salt with insecticidal, termiticidal, and fungicidal properties. The product can be diluted with water or made up as a foam and placed into woodpoles in or near the insect colony. The application holes are then sealed. The main species of insects controlled effectively using Tim-bor are both subterranean and dampwood termites, carpenter ants, and powderpost beetles.

Solid rods such as boron and copper rods are used as an internal treatment for woodpoles and sometimes other wood structures, to stop internal decay.

Boron rods contain mostly *anhydrous disodium octaborate,* which is fused under heat and pressure to form solid "glass" rods. The rods are inserted into holes drilled at the groundline region, into the core of the pole. The holes are then sealed. If the moisture content of the wood is high enough to make the wood susceptible to fungal attack, the rods slowly dissolve and form boric acid, which is water soluble and is carried to the areas with the highest moisture content, i.e., the areas most likely to be attacked by fungi or insects. As long as the moisture content is too low to permit fungal attack, the solid rods remain undisturbed in the wood. Boric acid is toxic to fungi and insects such as carpenter ants but is virtually benign to aquatic life. For this reason, the rods are employed to prevent internal decay in poles located near riparian (aquatic) areas.

2.9 History

BC Hydro has had an established remedial maintenance program for woodpoles for over 30 years. Over time, the Test & Treat program has incorporated new wood preservatives that are safer to the environment.

Here are some examples of historical practices:

- Some testing and treatments were done on a sporadic basis during the 1960's, but other than that, poles were bought untreated prior to the 1950's, and in northern BC, until the late 1970's.
- The first remedial wood preservation techniques used were sand collars, which contained creosote or pentachlorophenol (penta). A sand collar is a tin funnel placed around the base of a pole. This funnel was filled with sand, which was then soaked in penta or creosote, which seeped into the pole.
- Hydro began using penta bandages for remedial treatment of woodpole butts in the 1970's, continuing until the late 1980's.
- Hydro began using fumigants (metam sodium) in the early 1970's. Only poles found to have internal decay were fumigated.
- In 1989, Hydro began a policy of fumigating all inspected poles, whether there were signs of internal decay or not. Drill holes made during inspections act as early entry points for decay, so fumigating poles before decay begins is an effective preventive measure.
- In 1989, Hydro voluntarily placed a moratorium on the purchase of pentachlorophenol (penta-based) products, because of recent research on its unfavourable characteristics. Historically, penta contained small levels of dioxins and furans in it, which were identified as toxic and persistent substances by Environment Canada. BC Hydro was among the first Canadian utilities to voluntarily place a moratorium on the use of penta (most U.S. utilities and some Canadian utilities still use penta).
- During the 1990's Hydro introduced the use of copper naphthenate-based products, which were applied in bandages that were placed around the woodpole's butt.
- In 1993, Hydro began to look at boron rods for poles in environmentally-sensitive areas where normal wood preservatives can't be used. This proved to be safe and provided adequate pole protection. However, this treatment is more expensive and less effective than other internal treatments.

Research Trials and Initiatives

BC Hydro has always had a commitment to continually review other treatments and new technologies as part of its wider wood maintenance program As a result, the initial Test & Treat program became more developed

and organized over time. Some technologies were rejected; others were adopted or modified, depending on results. This continual research, testing, and improvement ensures that the products and procedures Hydro uses are always the most effective, environmentally-responsible, and cost-effective.

BC Hydro started its own research division, Powertech Labs, which is now a subsidiary of BC Hydro. The role of this lab is to evaluate products, equipment, techniques, and to perform life cycle analyses. One of its functions is to also research and evaluate wood preservatives and their effects on woodpoles and the environment, in an effort to help Hydro continually improve the woodpole test and treat program.

Some specific tests and research trials carried out over the years include:

- Pressure spade treatment on a test plot, where a chemical was injected along the pole (this technique was rejected as inadequate).

- In 1992, Hydro did a pole survey in the southern interior, looking at penta and borax retention in 50 poles in each region, in order to develop a more effective treating schedule. Hydro also looked at wet and dry regions of the southern interior to verify the efficacy of the initial treatment.

- In 1994, Hydro undertook some life cycle assessment studies to determine if a purchasing preference should be given to western red cedar poles over lodgepole pine poles. The study was inconclusive.

- In 1997, Hydro installed 100 steel poles in the Fraser Valley, Vancouver Island, and the Interior, to assess them in comparison with woodpoles. Their use was discontinued because they were easily damaged during transport and they are no longer manufactured locally.

- In the late 1990's, Hydro began a study that involved encapsulating the pole butt with a heavy, coated material, providing a virtual hermetical seal. The material is placed around the pole before it’s installed, preventing moisture transfer from or into the pole, thereby reducing the growth of microorganisms. Normally, when preservatives are placed in the pole, they are gradually degraded, but with the encapsulation technique, theoretically the preservatives never deplete. Hydro found that after three years, the growth of microorganisms was reduced by 35%. This study is not yet complete, but it's possible that in dry regions, the use of this technique may permanently negate the need for pole treatment. However, it is a more expensive alternative and would not be as feasible in wetter areas.

- Hydro recently did a survey comparing bandage types, specifically—sealed pre-made bandages vs. paste bandages made in the field, finding advantages and disadvantages with both.

- In pole yards, where there are large numbers of new, freshly treated poles, Hydro is currently testing an innovative technique for capturing trace contaminants potentially released from the poles. The technique involves a bark mulch "pillow."

- Hydro is currently testing the use of a 3M pole-top protector that is applied to the pole tops prior to shipment, to prevent decay from establishing in the top of the pole.

Standards Development

- In the 1970's, BC Hydro experienced rapid growth in the Test & Treat program with an accompanying shortage of resources and available quality poles—as a result, some purchased poles were substandard and many were not properly treated. As the program developed, Hydro applied a standard treatment cycle to most woodpoles: 20 years after initial installation, and then every 8 years thereafter.

- In 1980, a quality assurance program for woodpoles was introduced in BC Hydro.

- By 1987, BC Hydro had complete written standards for every aspect of its Remedial Woodpole Test & Treat Program. Since then, Hydro has continually refined and improved its written standards for the program.

- In 1992, the environmental and safety components of the Test & Treat standards were added.

- In 1996, extensive research was conducted to find an effective non-destructive assessment tool (the resistograph).

- In 2000, BC Hydro was restructured, and as a result, several full-time staff were committed to the woodpole program.

- In 2000, Hydro initiated major changes to its policy by optimizing the treatment cycles based on the efficacy of the preservatives in the wood. Hydro formalized the process to ensure that proper standards were being followed and made sure that bandages were applied in the correct year.

- In 2000, Hydro developed its *T&D Out-of-Service Pole Guidelines and Procedures*, which contain detailed guidelines for the proper handling, re-using, and disposal of woodpoles removed from service. BC Hydro is committed to the sound management of out-of-service poles as a way to reduce environmental impacts and minimize risks to employees and the public.

- In 2002, Hydro began work on a Pest Management Plan (PMP) which sets out the rationale and justifications for the woodpole Test & Treat program. This PMP, when authorized, will replace the Pesticide Use Permit system.

2.10 Personnel Qualifications

Key business units in BC Hydro, including the Distribution and Generation lines of business, are responsible for producing the PMP, and associated work methods and standards. The responsibility of supervising its implementation has been delegated to BC Hydro's Field Services division, including Pole Maintenance Inspectors/Coordinators, Pest Management Biologists, Vegetation Management Specialists and other designated field staff.

Because wood preservatives are controlled substances regulated by the federal and provincial governments, they can only be applied by provincially certified applicators trained to handle and administer them. Applicators must also be authorized by BC Hydro to inspect and treat poles.

Required Qualifications

BC Hydro Pole Maintenance Inspectors/Coordinators will have the following general qualifications:

- Structural Wood Certification from the Ministry of Water, Land and Air Protection (MWLAP)
- broad technical and operational knowledge of IPM principles and methods
- knowledge of and experience with wood preservative use
- knowledge of federal and provincial regulations pertaining to wood preservative use

BC Hydro Pest Management Biologists and Vegetation Management Specialists will have all the qualifications of Pole Maintenance Inspectors/Coordinators plus the following:

- Bachelor of Science in Forestry, Biology or equivalent
- significant training in riparian ecosystems (Utility Riparian Expert)

Applicator Certification Criteria

Preservative applications will be performed or supervised by a Certified Pesticide Applicator as per the BC Pesticide Control Act and Regulations (external links).

MWLAP Requirements

The Ministry of Water, Land, and Air Protection (MWLAP) requires current certification in the Structural Wood Preservation category in order to meet the requirements of the Act and Regulations.

The applicator's employer must possess a current BC Pest Control Service License.

- The Certified Pesticide Applicator will:
  - be in continuous attendance at the site
  - have proof of certification on hand
  - supervise no more than one uncertified assistant at one time
  - maintain continuous contact, auditory and/or visual, with the uncertified assistant
- Applicators will adhere to the requirements of the Worker's Compensation Board (WCB) for the appropriate first aid training and first aid kits.
- Applicators will adhere to WCB regulations for occupational health and safety, covering general safety procedures, hazardous substances, wood preservatives, confined spaces, protective clothing and equipment, tools, machinery, and equipment.

BC Hydro Requirements

In addition to the MWLAP requirements, BC Hydro has the following requirements for Certified Test & Treat Applicators:

- successful completion of a BC Hydro-sanctioned examination testing knowledge of the Test & Treat standards and procedures
- successful completion of a practical test demonstrating familiarity with BC Hydro's woodpole maintenance standards
- at least 800 hours of onsite work experience
- authorization by BC Hydro to inspect, test, and treat woodpoles

Trainees may apply wood preservatives under the direct supervision of a qualified applicator. A trainee that has never been certified by BC Hydro is considered to be an apprentice applicator. To become certified, the apprentice must follow and complete the procedures in Standard ES 64-A-03, *Certification Process, Test & Treat Applicator*.

Re-certification is required each time MWLAP certification is renewed, and if the applicator has been away from Hydro's Test & Treat program for more than one year.

The benefits of Hydro's certification program are as follows:

- applicators have excellent working knowledge of and adhere to the BC Hydro Distribution Maintenance Test & Treat standards
- applicators adhere to MWLAP standards
- applicators respect the public, the workplace, and the environment
- applicators have adequate field work experience and good working habits
- stringent and common assessment of all applicators
- quality control

Contractor Pre-Job

All work must be completed according to BC Hydro's Wood Pole Maintenance Standards. To ensure this, pre-job meetings are held at the beginning of each contract. All contract crews must attend.

The Pest Management Biologist or Vegetation Management Specialist and the Test & Treat Manager (or delegate) must also attend the pre-job meeting. The Test & Treat Manager may require other maintenance staff to attend the pre-job (i.e., Distribution Maintenance Coordinators or Pole Maintenance Inspectors/Coordinators). BC Hydro insists that only the applicators in attendance at the pre-job meeting may perform BC Hydro Test & Treat work. The Pest Management Biologist or Vegetation Management Specialist will:

- ensure contractors understand proper application techniques and correct quantities to use per pole
- review requirements for transportation of dangerous goods
- review required No Treatment Zones for fish habitat and groundwater sources
- discuss properties of the products used (*Material Safety Data Sheet* review)

The pre-job meeting covers safety procedures and the technical requirements of pole maintenance, as well as the requirements for ensuring environmental conformance (see Standard ES-64-B-07.12).

Chapter 3
Environmental Protection and Consultation

BC Hydro has produced operational standards to ensure that its activities have minimal impact on the natural environment. In addition, Hydro must also adhere strictly to government rules and regulations.

If there are issues raised during the implementation of this plan by affected stakeholders, Hydro will endeavour to address them. Hydro makes every effort to ensure that its work does not damage private property.

This chapter covers the following topics:

3.1 Overview

BC Hydro has adopted the concept of sustainability, which means achieving an appropriate balance between a viable business, protection of the environment, and recognition of how its activities affect the well-being of the community. Corporate policy stresses the need for being pro-active in the protection of the environment. Therefore, Hydro will actively pursue opportunities to manage resources for the benefit of present and future generations at all stages of its operation.

BC Hydro's use of remedial wood preservatives on wood structures does not harm the environment or wildlife, because most preservatives used are of low to moderate toxicity and products are placed carefully inside the pole or sealed securely against the pole below the groundline. Therefore, neither the public nor wildlife will come into contact with the wood preservatives. After application, the wood preservatives do not travel in the soil and are not released into the atmosphere. None of the products used are ozone-depleting.

Research has shown that wood preservatives leach very little outside woodpoles, usually not at all, but never more than a few inches, and in concentrations well under government standards. For specific evidence, see:

- Cartlidge, D.M. 1996. *Toxicity of leachates from boron rod treated poles*. Powertech Labs Inc. Project: 7060-44-00.
- Cartlidge, D.M. 2001. *Field evaluation of two commercial groundline wood preservative bandage systems*. Powertech Labs Inc. Final Report: Project: 12951-43.
- Cartlidge, D.M. 2002. *Literature Update – Environmental Impact of Remedial Wood Preservatives,* Project # 13570-43-00, June 6. Powertech Labs Inc.
- Eisler, R. 1990. *Boron Hazards to fish, wildlife, and invertebrates: a synoptic review*. Biological Report 85 (1.20). U.S. Fish and Wildlife Service.
- Hemmera Envirochem. 2002. *Summary of environmental impact studies of treated power poles in Belcarra, BC.*
- Michalenko, E.M. Ph.D., S.W. Kaczmar, Ph.D., and B.A. Brown, Ph.D. 1993. *A Field Study of Mobility of Supplemental Wood Pole Preservatives in Adirondack Wetlands.* American Wood-Preservers' Association. Vol. 89. 22-50.
- Ritter, Leonard. 2002. *Statement of Leonard Ritter, PhD, In the matter of Pesticide Control Act Appeal—Sunshine Coast Regional District v. September 20, 2001 Issuance of Pesticide Use Permit 105-958-01/03 to British Columbia Hydro and Power Authority*. May 9, 2002.
- Ruddick, J.N. 2001. *Review of Literature on environmental impact of remedial preservative treatments for wooden poles*. Prepared for BC Hydro Transmission and Distribution NTZ Task Force.1-46.
- Ruddick, J.N. 2002. *Analysis of Potential for Metam Sodium to Leave Remedially Treated Poles and Enter Well Water at Belcarra,* April.
- Ruddick, J.N. 2002. *Modeling of "worst case" scenario for loss of copper naphthenate and Metam sodium from remedially treated poles*.
- Ruddick, J.N. 2002. *Response prepared by John Ruddick for Pesticide Control Act Appeal*, May 8.
- Ziobro, R.J., T.C. Anderson, D.J. Herdman, J. Guzzetta, and T. Pope. 2002. *Chemical analysis of Southern Pine pole stubs thirteen months*

following treatment with three Methylisothiocyanate based commercial fumigants. The International Research Group on Wood Preservation, Sec. 3, 1-12.

Hydro's *T&D Out-of-Service Pole Guidelines and Procedures* contain detailed guidelines for Hydro staff and contractors on the proper handling, re-using, and disposal of woodpoles removed from service. These guidelines ensure that risks to people and the environment are minimized.

3.2 No Treatment Zones

Hydro has developed a process that is followed by all contractors to ensure specific wood preservatives are not used within established No Treatment Zones (NTZ). An NTZ is defined as the distance between the edge of a water source or waterbody and the closest permitted point of application of specified wood preservative. Multiple NTZs may apply at a given location depending on the number and type of wood preservatives used.

A multi-agency task force researched the environmental impact of Hydro programs and established NTZs based on factual data. Members from both industry and regulatory agencies participated, including the BC Ministry of Health, Environment Canada, Department of Fisheries and Oceans, Ministry of Water, Land and Air Protection, TELUS, FortisBC (formerly Aquilla Networks), the University of British Columbia, and BC Hydro environmental staff.

The task force performed an extensive literature search to determine the environmental and health impacts of wood preservatives used by BC Hydro. It developed the terms of reference for the literature search and retained the services of the Department of Wood Science at UBC to perform the search.

The recommendations of the literature search identified a few data gaps in published literature, and BC Hydro engaged Powertech labs to fill the data gaps. Following the literature search, a scientifically-based field study was conducted to determine the mobility and persistence of the wood preservative products in the environment around poles. BC Hydro is reviewing the information with the NTZ team, but proposed NTZs are listed in Table 3.

Table 3: No Treatment Zones

Product	No Treatment Zone *					
	Fish Bearing Stream	Non-Fish Bearing Stream - Wet	Non-Fish Bearing Waterbody – Dry (provided pole is greater than 10m from fish-bearing waterbody)	Human Consumption Water Well (surface/drilled)	Non-human Consumption Water Well (surface/drilled)	Point of Diversion
Solid Internal Preservative	1 metre	0 metres (above water line)	0 metres (above and below groundline)	10 metres	10 metres	5 metres upslope
Liquid Internal Preservative	3 metres	1 metre	0 metres (above and below groundline)	10 metres	10 metres	10 metres upslope
Groundline Bandages and External Brush-on Treatments	3 metres	1 metre	1 metre	10 metres	10 metres	10 metres upslope

*** Notes:**

- Liquid internal preservatives will only be applied to the portion of the pole that is permanently above the waterline.
- Solid internal preservatives can be used in locations that may be below the water table for portions of the year, provided they are not fish-bearing.

3.3 Community Watersheds

Community watersheds are defined in the Forest and Range Management Act (external link), Part 9, Section 150. Pesticides can be used in community watersheds only in the context of an integrated pest management (IPM) program.

Contractors and Hydro staff will follow the guidelines in the Ministry of Forests document *Community Watershed Guidebook* (external link). The basic requirements as specified in the code are:

- Before a pesticide is applied in a community watershed, the water licensee must be notified.
- A minimum 10m No Treatment Zone, except for biological pesticides, must be maintained around all streams, lakes, and other waterbodies within the community watershed.
- Pesticides must not be stored in a community watershed for more than 24 hours before application and 7 days beyond the conclusion of the application, unless they are contained within a permanent structure.

- If a pesticide or pesticide breakdown product is detected at a community watershed intake, then no further pesticides will be used until the Ministry of Health's medical health officer is satisfied that all necessary measures have been taken to preserve water quality.

All watersheds in BC are mapped in a computerized database maintained by the Ministry of Sustainable Resource Management. Hydro staff will refer to a map overlay showing the overlap of powerlines with community watersheds, and the locations of water intakes.

3.4 Wells, Water Intakes, and Groundwater Identification

See Standard ES 64-B-07.13 for details.

Many BC communities do not have a municipal water system. Individual homeowners have private groundwater or surface water sources for domestic water. BC Hydro is restricted from applying wood preservatives within defined No Treatment Zones (as per Table 3) around wells and intakes.

To identify locations of wells and surface water intakes, and to ensure NTZs are respected during woodpole Test & Treat work, Hydro has developed *Groundwater Source Identification Process Flowcharts*, one for Hydro staff and one for contractors (included as attachments to this PMP). This standard will help applicators and BC Hydro staff locate sources of groundwater before any wood preservative is applied.

Hydro identifies the location (by obtaining the best available information from MWLAP and local governments) of all known sources of groundwater in advance and indicates them on Test & Treat maps, which are provided to contractors.

Before starting Test & Treat work, contractors will attend a pre-job conference, at which a *Pre-Job Checklist and Sign-off Sheet* (see standard ES 64-B-07.13) will be reviewed and signed by each applicator and a Hydro representative. The checklist is a mechanism to ensure that all groundwater and other riparian issues are discussed and understood by each applicator.

3.5 Fish/Wildlife and Riparian Areas

BC Hydro recognizes the vital physical and ecological roles fulfilled by aquatic, marine, riparian and other ecosystems and recognizes the importance of protecting these systems to ensure their long-term sustainability.

BC Hydro and its contractors will adhere to the following mitigation measures:

- Workers will always use extreme caution when working around any waterbody and not threaten the integrity of any waterbody in the area. For example, workers will be instructed at the pre-job meeting to keep a minimum of 10 metres away from the NTZ when:
  - refilling dispensing equipment
  - fuelling equipment
  - cleaning equipment
  - preparing below-ground pole bandages
- During below ground inspections, if water fills the excavation, only solid rods will be used in above ground portion of pole, in compliance with the approved NTZs.
- Poles sitting in water are inspected and treated only if permitted by the designated NTZs (i.e., the water around the pole must not lead directly to fish habitat).

3.6 Public Health and Aesthetics

Adjacent to children's parks, schools, daycare centres, and other similar facilities, and within livestock paddocks, a pole bandage seal will be applied to cover the above ground portion of the bandage. The seal is a thin metal sheet, nailed around the pole, over the top portion of the bandage. The bandage serves to arrest below groundline decay on the surface of the pole by preventing the entry of fungi and insects into the pole (see Woodpole Standard ES-64-B-07.05 for details).

Hydro makes every effort to ensure lawns, flowerbeds, and landscaped areas are not damaged and left in the same condition as they were found. Once Hydro is finished treating a pole, little or no sign will be left indicating that workers were there. To accomplish this, excavated soil may be placed on tarps or sacks to speed up backfilling and keep lawns soil-free. Sod is peeled back on lawns prior to excavation and replaced when work is completed. Where poles are set in concrete or blacktop, special tools are used as required.

In the vicinity of certified organic farms, it is the responsibility of the grower to maintain appropriate buffers between their organic crops and BC Hydro's power poles. As recommended by the *BC Organic Agricultural Products Certification Regulation, Operations Policies and Farm Management Standards,* buffer strips eight metres wide (containing a hedgerow or trap crop where feasible) must be located between the certified organic farm and the woodpole.

The transport and storage of woodpoles is done in an environmentally sound manner:

- Poles are stored according to industry standards, and storage sites have been assessed to determine sensitivity.
- At sensitive sites, monitoring is completed to ensure compliance with provincial standards.
- Numbers of poles at each storage yard are kept to a minimum, minimizing the potential for site contamination.

3.7 Species Requiring Protection

Woodpeckers and other cavity-nesting species tend to be attracted to woodpoles, because they are similar to standing dead trees, which woodpeckers prefer because of the presence of insects and grubs. Also, researchers believe when the birds tap on poles, the electrical equipment produces echoing resonant frequencies, which woodpeckers exploit to attract mates.

BC Hydro's efforts are aimed at control of woodpecker damage (not control of woodpeckers themselves). This involves restoring the strength of the pole, preventing further excavation by woodpeckers, tightening the equipment to reduce resonant frequencies, and preventing moisture from collecting in the cavity and increasing decay.

Woodpeckers do not come into contact with the remedial preservatives (unless the pole tops are treated) because they attack the top sections of woodpoles. Remedial preservatives are applied internally near the groundline of the pole and externally below the surface. This means that small mammals and ground-foraging birds are not adversely affected either by the remedial preservatives. Birds very rarely nest in woodpoles, but if an active nest is present, the woodpole will not be removed unless for safety reasons.

3.8 Consultation and Notification

Public Notification

Notification of intent to treat is done, prior to start of work, by advertising once a year in newspapers with circulation in the treatment area. Advertising will describe the location and type of work to be undertaken. Such advance notification helps address any public concerns before work starts.

First Nations Notification and Consultation

Consultation is essential to maintain positive relationships with First Nations. BC Hydro consults with First Nations to:

- provide a forum for meeting First Nations so we may learn more about their unique culture and heritage
- provide First Nations an opportunity to learn of BC Hydro programs and of economic development opportunities that may be available
- Offer interested First Nations demonstrations, product information, training, and opportunity to bid on contracts (when qualified to do so.)

For Woodpoles on Reserve Lands

BC Hydro will follow these steps:

1. A letter will be sent indicating that inspections and treatments are proposed, and that we require permission to treat the poles. The letter will stress the risks and liability associated with not treating the poles. It will be sent by registered mail or courier.
2. For those who respond, written permission will be requested. Agreement or disagreement will be documented, along with any requests for notification, people to contact, or information or meetings requested. Requests will be forwarded to the Pest Management Biologist or delegate and their manager advised of any commitments made.
3. For those First Nations who have not responded, a BC Hydro representative will attempt to meet with the appropriate representative of the First Nations band to request permission to treat. The results of any discussion will be documented.
4. If no permission is obtained, the application of wood preservatives will *not* take place. However, BC Hydro must maintain woodpoles, so inspections to determine the safety and reliability of the woodpoles will still be completed. First Nations who have refused treatment on their reserves will be advised of the increased safety risk to their community. A final letter will be sent summarizing previous discussions.

Chapter 4
IPM Program for Woodpoles

This chapter describes integrated pest management (IPM) principles for preserving woodpoles. Topics covered include:

4.1 IPM Steps

Here are the main steps to be followed for woodpole IPM. They are covered in this chapter of the PMP unless otherwise noted:

1. Prevent woodpole deterioration (through inspection and maintenance requirements)
2. Implement maintenance cycles
3. Identify pests
4. Inspect woodpoles
5. Determine action and select treatment methods
6. Treat (see Chapter 5)
7. Evaluate

4.2 Prevention

BC Hydro's Remedial Woodpole Test & Treat Program is primarily a preventative program. Every aspect of woodpole management is geared to prolonging the pole's life, from initial purchase to ongoing inspection and maintenance programs.

Purchasing

BC Hydro prolongs the life of the woodpole and reduces the need for wood preservative treatment by buying high quality wood, and by buying pre-treated woodpoles. Over the past two decades, BC Hydro has developed stringent purchasing requirements that exceed industry standards for the cleanliness and stability of the wood preservatives used. By ensuring that only the highest quality woodpoles are purchased, Hydro ensures that remedial work will be reduced and the pole's life will be long.

Hydro's purchasing history of poles includes the following:

- Hydro began purchasing some full-length penta-treated poles in the early 1960's.
- In 1976, Hydro began purchasing all of its poles pre-treated, both butt-treated and full-length treated.
- In the mid-70's, Hydro installed some full-length CCA-treated poles (chromated copper arsenate) and ACA-treated poles (ammoniacal copper arsenate).
- In the mid-80's, BC Hydro reviewed the types of poles available on the market and determined that CCA-treated woodpoles (using chromated copper arsenate) were the best choice, rather than ACA-treated poles.
- In 1991, BC Hydro started exclusively purchasing CCA-treated poles.

Stubs and Pole Tops

See Standard ES-64-B-08.04 for details.

BC Hydro also prolongs the service life of poles by installing wooden or steel reinforcement (stubs) beside poles that have decayed below ground.

Where possible, deteriorated pole tops are removed and replaced with an extension or, if the pole is tall enough, the wires and hardware are moved down on the pole, with the pole remaining in service.

If a pole top is not yet visibly decayed enough to warrant removal of the decayed portion, the top is protected from further decay with a cover or sealant. Without moisture, wood-decaying fungi cannot exist, nor can water cause swelling of the wood fibres during freezing weather that would break down the wood.

Aluminum sheets are not permitted to be used as covers for distribution poles. Pre-manufactured rubber or plastic caps are sometimes used, however.

Pole-top protectors are applied in conjunction with other planned work to all butt-treated and full length-treated poles where the pole-top is suitable to treat (less than 25% loss of sapwood). Inspections are undertaken to assess pole-top conditions of poles identified in the Test & Treat program to evaluate whether capping or repair of the pole top is required. Along with the pole-top inspection, the condition of cross-arms is assessed and deteriorated cross-arms replaced.

4.3 Maintenance Cycles

See Standard ES-64-B-07.01 for details.

The BC Hydro Remedial Woodpole Test & Treat Program is designed to prevent the deterioration of the poles from insects or decay. Therefore, wood preservatives are applied or re-applied before the pests are present. Through years of research, specific maintenance cycles have been developed.

The length of cycles is based on a combination of the manufacturer's recommendations, woodpole type and size, climate and environment, common sense, and the practical requirements of the program.

- The first remedial application of wood preservatives is not required for an average of 20 years, and ranges from 14 to 27 years, depending on the climate and type of pole. After that, all poles are placed on an eight-year maintenance cycle.
- The 8-year cycle constitutes a preventative program. Even though rot may not yet be present at the time of the maintenance cycle, the risk of incipient rot is significant. Long-term research has shown that this is the most effective, cost-effective, and environmentally-responsible cycle.
- In general, the cycle is an industry standard, consistent between utilities. Some U.S. states may treat initially at 10 to 16 years, but this is a function of differing wood types and climates, compared to BC.
- The 8-year cycle likely cannot be extended because approved preservatives typically are depleted at or before eight years. However, the cycles are regularly evaluated to determine the optimum treatment frequency.
- Bandages are placed only on poles that need it, but all inspected poles are fumigated, whether there were signs of internal decay or not. Drill holes made during inspections act as early entry points for decay, so it is important to fumigate poles before decay begins, as an effective preventive measure. Drill bits are also used repeatedly without being sterilized, and could possibly carry pest organisms from pole to pole.

Off-cycle Treatment — Changes in road grades or other damage to poles may occur, requiring applicators to go in and treat poles outside the cycle. Also, there may be infestations of ants and termites that occur off-cycle. These are brought to Hydro's attention by homeowners or by line crews inspecting equipment. Formerly, certified Hydro staff needed a Service Licence Endorsement to treat such infestations if they were outside an existing permit area, but this PMP will now cover such work.

Planning

As the Test & Treat program developed through the late 1970's and 1980's, Hydro began applying preservatives at every cycle on every pole—at 14 years after initial installation for butt-treated distribution poles, and 20 years for full-length treated distribution poles. Each pole was then re-treated every 8 years. In 1987, cycles were further modified and refined.

Most Distribution areas in BC have been broken up into eight blocks of roughly the same size and number of poles, with each block assigned to an 8-year remedial Test & Treat cycle. A different block is re-treated each year.

There are three types of BC Hydro management plans for woodpole maintenance:

- eight-year Woodpole Management Plan
- Work Management Plans for each geographic region (Vancouver Island, Lower Mainland, Southern Interior, and Northern)
- District Management Plans within each regional management plan

The BC Hydro Enterprise Geographic Information System (EGIS) database contains a record of every Hydro distribution pole in BC, including the year the pole was set, initial treatment, wood species, and the type and year of maintenance activities performed. Other computer data collection programs use EGIS application programs to generate listings of poles and manage data to produce long-term plans.

Maintenance Requirements

For detailed information on precise maintenance requirements for different types of poles, see Standard ES-64-B-07.01. The start of the maintenance cycle varies with the type of initial treatment.

- Full-length treated cedar poles are inspected and treated 20 years after installation and 8 years thereafter.
- Full-length treated non-cedar poles are inspected and treated 14 years after installation and 8 years thereafter.

- Butt-treated poles are inspected and treated 14 years after installation and 8 years thereafter.
- Untreated poles are inspected and treated every 8 years.

4.4 Inspection Procedures

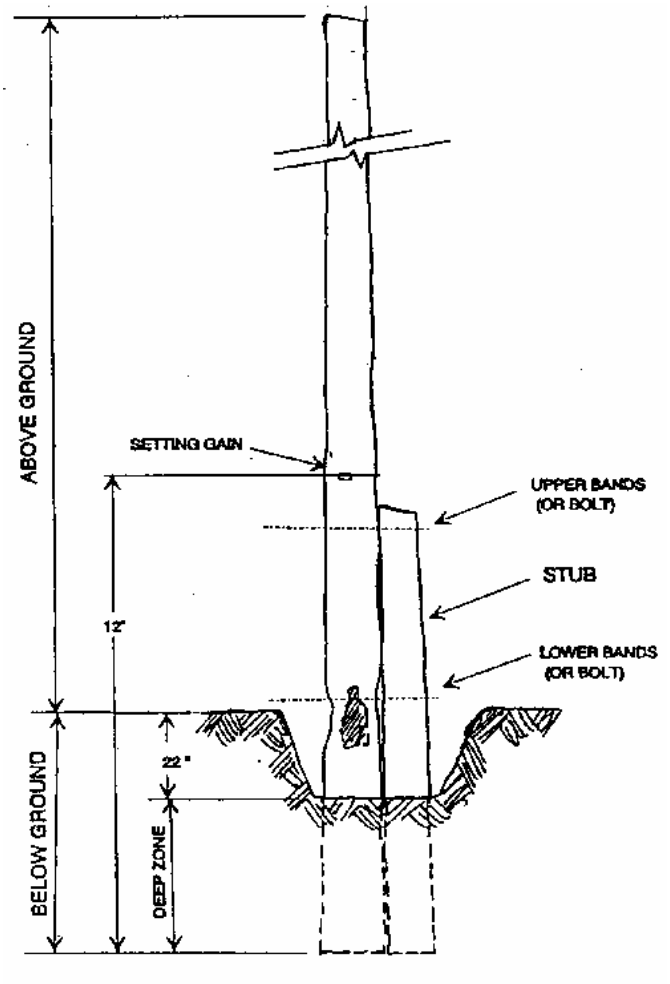
See standard ES 64-B-07.02 for details.

Every year, BC Hydro inspects and tests about 70,000 distribution poles. About 3–4% of poles are identified for replacement due to insufficient shell thickness or extensive shell rot. Another 3% are recommended for groundline reinforcement (stubbing) due to the presence of moderate decay at or below the groundline. Hydro also uses various pole top refurbishing techniques to restore deteriorated poles.

Poles are selected and inspected by certified Test & Treat inspectors (contractors), who follow woodpole maintenance inspection standards for in-service woodpoles. A complete full structural integrity examination is done to determine what type of treatment is required to extend the service life of the woodpole. Information is recorded in a data collection management system.

Inspections must be done above ground, below ground, and partially below ground (as applicable). For more information, see Figure 1, which shows the above-ground and below-ground portions of a pole.

Figure 1: Woodpole—Above Ground and Below Ground



The results of the inspection will determine what action to take in servicing a pole—whether to treat, stub, or replace. (For the purposes of the PMP, this corresponds to determining the "action levels" at which treatment will be applied.) Woodpole treatment procedures, including for stubbed poles, are covered in Chapter 5, *Treatment of Woodpoles*.

Above Ground Inspection

Above-ground inspection involves:

- visual examination
- sounding
- probing for internal rot using a drill

External Inspection

This is a visual inspection of the above-ground zone of a pole or stub. If obvious damage renders the pole unserviceable or unsafe, the pole must be recommended for replacement.

Via a visual inspection above ground, the inspector will identify and document the following defects:

Surface decay — Very loose or ragged sapwood (>2.5cm) presents a climbing hazard for power line technicians.

Checks — Checks are separations along the grain of wood across the annual rings (not cracks). Checks do not reduce pole strength, but serve as avenues for decay spores to enter the pole.

Breaks/Cracks — These are separations of wood fibres across the axis of a pole (lateral damage). A cracked pole must be recommended for replacement and reported immediately to the local BC Hydro office.

Woodpecker damage — Generally, small woodpecker holes, particularly those that follow checks, do not significantly reduce the strength of a pole. A very large woodpecker hole (>7.5 cm diameter) or several smaller woodpecker holes at the same general location on a pole will weaken the pole significantly and may be an indication of insect infestation and/or unsound wood.

Fire damage — Fire damage on the lower body is normally caused by grass or bush fire and is usually only superficial. Signs of such fire damage will be documented and reported.

Pole top rot — This is present where losses appear at the outer circumference of the pole top and/or indentations appear along the apex of the pole top.

Insect infestation — Insect infestation can be recognized by one or more signs, such as obvious insect activity, frass or sawdust, or holes on the surface of the wood (see Pest Identification).

Internal Inspection

Internal inspection involves sounding with a hammer to detect internal decay, as well as probing for rot with a drill.

Sounding — Sounding will detect internal decay of a pole or stub. A hammer is used to strike the surface of the pole from the groundline to as high as can

be reached. A sharp ring indicates sound wood, whereas a hollow sound or dull thud indicates hollow heart or decay.

Probing — Probing will detect decay in checks and pockets. If the wood yields, rot is suspected. Suspicious areas are investigated by drilling.

Drilling — Drilling will determine the condition of the inner wood.

While drilling, the inspector takes note of the following:

- The rate of penetration of the drill—a sudden collapse of the wood being drilled indicates decayed wood or hollow heart.
- Powdery wood particles indicate insect infestation or dried out decay.
- Discoloured wood particles such as severe darkening almost always indicate the early stages of internal decay. In the late stages of decay, the wood may become soft and spongy, stringy or crumbly.

If internal decay is found by drilling, then two additional holes are drilled, equally spaced around the circumference of the pole at the same horizontal plane. The shell thickness is measured through the three holes.

- If the effective shell thickness is less than 7.5 cm, the pole must be recommended for replacement; no further testing is required.
- If the effective shell thickness is greater than 7.5 cm, the inspection continues.
- All holes must be treated with preservative and sealed with plastic dowels at the end of the inspection.

The effective circumference is also measured—this is the minimum circumference at the location of decay, less deductions for the decay. (See standard ES 64-B-07.03 for details.) If the effective circumference is less than the required circumference for the pole to safely carry its electrical load, the pole must be recommended for replacement. Otherwise the below-ground inspection continues.

Below Ground Inspection

Below-ground inspection involves:

- partial or full excavation of the ground around the pole to expose the pole surface
- removal of external shell rot
- sounding the pole section below the groundline
- probing for internal rot using a drill

If unsafe, poles are not excavated—i.e., if the pole is rotted through at groundline or if it is not set deep enough in the ground.

Where poles are set completely in concrete, they are inspected using the above-ground inspection procedures, not below-ground. If poles are set partially in concrete, the below-ground portions of the poles not covered by concrete are inspected, as well as the above-ground portions.

External Inspection

The pole is excavated to a depth of 65 cm. The old bandage is removed and shell rot (i.e., loose sapwood) is shaved-off from the pole exposed by the excavation. A scraper, wire brush, hatchet, or spud (small shovel) is used to remove decayed wood.

Internal Inspection

Pockets and checks are probed and any decay is removed. If internal decay is suspected, drilling is done to confirm.

If the effective circumference is equal or greater than the required circumference, drilling at the bottom of the excavation is done to check for decay further down the pole.

If required, bandage treatments are applied after ensuring that all drilled holes are fumed and sealed with plastic dowels.

Partial Below Ground Inspection

In a partial inspection, only one quadrant of the pole is exposed by digging it up to a depth of 65 cm below the groundline. The exposed bandage, if present is removed and then replaced after inspection. A new quadrant must be selected each time so that the most accessible area is not checked repeatedly.

Stubbed Pole Inspection

On stubbed poles with wood stubs there are two sets of fasteners (bands)—one located near the top of the stub and a second located near the groundline. Sometimes, after installation, the lower set of bands is buried due to road grade changes. When buried, decay around the bands is prone to develop. Where possible, the earth covering the buried bands is removed. Loose or damaged bands are noted on the report form.

4.5 Method Selection

See Standard ES-64-B-07.02 for details. Flowcharts to aid in the inspection and method selection process are contained in Standard ES-64-B-07.01.

Before making recommendations on the action (treatment) to take—whether to treat, stub, or replace woodpoles—the serviceability of the pole must be properly evaluated. The decision to carry out treatment or recommend stubbing or replacement, depends on the circumference and strength of the pole, and the presence of any rot or damage.

Serviceability Testing

Except as restricted by NTZs, wood preservative treatments will be applied to all serviceable woodpoles. A woodpole's serviceability is related to its strength, circumference, and the presence of decay or damage.

The strength of a pole is related to its physical properties. The larger the diameter and the shell thickness, the stronger the pole. The pole is considered to be strong enough to remain in service when:

- the pole shell is safe to climb
- the effective circumference at the groundline zone (below ground, at ground or up to 1.3 m from the ground) is equal to or greater than the required circumference needed for the pole to safely carry its electrical load
- the effective shell thickness below the groundline is 5 cm or more
- the effective shell thickness above the groundline is 7.5 cm or more

Serviceability tests are carried out with a resistograph. This tool is a portable instrumented drill that gauges the soundness of wood fibres by measuring the resistance to a fine drill needle. It measures the shell thickness of a pole, which helps pole inspectors determine the condition of the pole more accurately, thus reducing the number of poles replaced annually. Resistograph testing is done on all poles recommended for replacement, stubbing, or further inspection by Test & Treat contractors. Results are recorded on the BC Hydro *Pole Evaluation* form.

Stubbing Criteria

Woodpoles will be stubbed when recommended by the contractor during the Test & Treat program, or when deemed necessary by the line crew. Stubbing takes precedence over pole replacement. Stubbing activities will be carried out according to operating, safety, and environmental requirements detailed in pre-job meetings and related documentation.

Stubbing will be done when the:

- effective shell thickness below ground is less than 5 cm

- effective circumference at the groundline zone is less than the required circumference
- below groundline area of a pole is weakened beyond acceptable strength limits (causes of such weakening are biological decay and/or mechanical damage)
- poles are not set deep enough in the earth to provide the required stability (this situation occurs when the ground level is lowered or when a pole is raised to provide additional clearance)

The above-ground portion of the pole must be in good condition and meet the strength requirements.

Replacement Criteria

Poles are generally replaced as a result of pole maintenance inspections, or when other parts of the structure are replaced due to age, including cross-arm timbers, insulators, and wires (called “plant renewal”). Poles will only be replaced when necessary, to reduce costs and support BC Hydro’s environmental objectives. Whenever possible, poles will be stubbed.

During pole maintenance inspections, poles must be replaced when:

- extensive physical damage above ground is evident
- the effective shell thickness above ground is less than 7.5 cm
- on a stubbed pole, internal decay is evident at the band or bolt locations
- internal or external decay is found on a pole’s wood stub

During plant renewal, poles will be replaced when:

- the strength of the pole is inadequate to support the new load
- the pole is too short and cannot be extended with a pole-top extension
- the pole is relocated
- the pole is unsafe to climb due to extensive shell rot, checking, or physical damage
- the grade is changed (raised or lowered) at the pole
- a customer requests a relocation
- the extent of pole-top rot is more than 43 cm and the conductor elevation cannot be lowered

4.6 Pest Identification

See Standard ES-64-B-07.04 for more details, as well as the *Integrated Pest Management Manual for Structural Pests in British Columbia* (Ministry of Water, Land and Air Protection).

There are two basic groups of pests that attack woodpoles: above-ground pests and below-ground pests. Some pest species can be present in both above and below-ground situations. The main pests to be controlled are:

- wood-nesting ants
- termites
- wood-boring beetles
- wood-decaying fungi

Biology of Pest Species

It is essential to identify pest problems correctly to plan effective control programs. The key to effective control is knowing the biology of the pest, including the life cycle, behaviour patterns, and habitat preferences. Once a pest species is identified, woodpole staff and contractors can look up information on its biology.

Knowledge of the biology of the pest species enables woodpole staff and contractors to:

- accurately monitor a population by inspecting where the pest is most likely to be present
- modify the habitat to make it unattractive
- use the most appropriate controls at the right time in the pest life cycle
- place controls where they will have the most effect

Identification Procedures

Insect infestation is normally recognized by one or more of the following signs:

- obvious insect activity
- piles of wood fibre or sawdust-like material
- round or oval holes on the surface of the pole
- galleries under the surface of the wood, which may or may not be packed with excrement or other material

The species can be identified by:

- comparing specimens with an insect collection
- referring to pictures and pictorial keys
- recognising characteristics of their damage, excrement, or castings (called *frass*)
- consulting experts for difficult or unfamiliar species

Ants

Wood-nesting ants can be found in all parts of the province. They live in colonies, hollowing out nests in poles for shelter, but they do not eat the wood for food. Identification signs include a pile of sawdust at the pole's base, and ants seen scurrying around poles in search of food.

Ants tend to be more prevalent in areas that have a high water table. They frequently seek out high moisture areas in and around wood structures and build their nests in damp wood. In most cases, incipient or advanced decay is already present in wood before ants begin excavating nests.

Carpenter Ants

There are several species of carpenter ants in BC. The most problematic one is a wood-boring pest, a large (6–12 mm) brownish to black ant with a prominent node on the stem between the middle body segment and the final body segment. Reproductive adults have wings. They target mainly damp or unsound wood to excavate tunnels and nesting cavities, but sometimes they target sound wood as well. Damage is characterized by smooth galleries that run against the grain of the wood.

Cornfield Ants

These small, tan-coloured ants are secondary pests of already-decayed wood, and they speed the rate of deterioration. Their galleries are quite different from those of carpenter ants.

Thatching Ants

There are several species, which may be red and black or all black, and appear in a wide range of sizes. Their nests are in rotting wood and the surrounding soil or rock cavities.

Termites

Both dampwood and subterranean termites, although different in size, have bodies of similar shape and uniform width. The reproductive adults have wings.

Dampwood Termites

These termites build their nests in the wood, which they use for food. They follow the grain, preferring soft, damp wood. Galleries may extend well up in the pole, often producing a honeycomb effect, and are usually packed with small brown pellets (droppings), which may also be found at the base of the pole. Openings to the exterior are sealed and most of the frass remains inside the pole.

They take the form of nymphs (20 mm, creamy brown body and large black jaws) or winged reproductives (25 mm, brown bodies with lighter, multi-veined wings that may be twice as long as the bodies).

Dampwood termites are usually found in coastal areas, on Vancouver Island, and in the Arrow Lakes area.

Subterranean Termites

These are similar to, but smaller than dampwood termites. Nymphs may be up to 6 mm long, with pale yellow heads and small black jaws. Winged reproductives are about 10 mm long, with black bodies and pale, finely-veined wings about twice as long as their bodies.

The colony usually lives in the soil and only attacks poles for food. They may attack dry wood, and they do not leave pellets in the nest, but may leave mounds of dark, fine grit at the base of the pole. Sure signs of their presence are the distinctive mud tunnels (shelter tubes), which may extend from the ground up into the pole.

Subterranean termites are found on the east coast of Vancouver Island and in the Interior regions.

Beetles

Powderpost Beetles

Most damage by beetles is caused by several different species of Powderpost beetles. They are small, narrow, and elongate, and may be smooth or slightly hairy. Colours range from yellow to brown to black. They have a prominent head with large eyes, a well-developed thorax, and slender legs.

They are attracted to damp wood and standing pine poles that already have internal decay, and are most often found in the vicinity of the groundline.

Entrance holes are so small they are rarely observed, but exit holes are large enough to be seen, with frass that looks like fine sawdust falling out of the holes. Larvae may be present in the wood for up to 20 years prior to pupation and emergence as a mature beetle. In most cases, there are only a few larvae present in any given pole and pole failure is rare. However, as the population increases, they may reduce much of the interior of infested wood to a powder.

Other Wood Borers

Bark beetles, buprestid beetles, and longhorned beetles enter and feed on wood shortly after trees are cut, and do not enter a log or pole once the bark has been removed.

Detection of these beetles usually goes unnoticed until they begin exiting the poles as mature beetles. Entry holes for the smaller beetles are the size of pinholes, but the larger exit holes are often used by fungi or other insects as entry points. Woodpeckers are also attracted to the chewing of beetles. They cause less structural damage as their numbers are few and they do not re-infest the peeled pole.

Bark beetles are small (2–8 mm long), compact, cylindrical, and mostly dull brown, gray, or black with a variety of lines and dots. Antennae are short and clubbed.

Buprestid beetles are 3 mm to 2.4 cm long, compact, smooth, polished, variously marked or indented, with wing covers bordered with coppery-gold. Colour patterns may be dull or bright, often iridescent green or blue. The thorax and abdomen are closely joined, the body somewhat flattened and slightly tapered and pointed at the rear. The larvae are called flatheaded woodborers, and these are the wood pests, not the adults.

Longhorned beetles can be up to 6.3 cm long, the body shape long, and somewhat flattened or cylindrical. Their antennae are usually longer than the body. They have powerful mandibles, long legs, and claws. The larvae are called round-headed woodborers, and these are the wood pests, not the adults.

Wood Decaying Fungi

Decay-causing fungi attack the cell walls of the pole, reducing the strength of the pole. Although some fungi may be present in the wood during pole production, over the life of the pole, most species enter the pole surface from the soil or through above-ground checks or bolt holes. The butt section of the pole in contact with the ground is the most vulnerable to attack. Also vulnerable are the tops of treated and untreated poles.

Decay can be seen on the pole in the form of shell rot (rotten sapwood) or heart rot (rotten heart wood at the centre of the pole). If no remedial action is taken, the support of the line (pole-top pin, cross-arm bolts, guy hooks, etc.) will be weakened or even lost.

Several fungi are tolerant to chemicals, such as copper or phenols. This is important as they may colonize treated wood, particularly wood that is treated below standard requirements. Consequently, the industry has developed multiple component formulations to ensure protection even against tolerant fungi.

Biology of Decay Fungi

Wood-attacking fungi are plants without chlorophyll. Because they cannot produce their own food, they must obtain their energy and carbon requirements from an organic source (such as wood). Fungi need an acceptable temperature, adequate oxygen and water, and food (including micronutrients) to grow and thrive. Fungi grow via tubular cells called hyphae, which can penetrate throughout the wood. They reproduce by releasing microscopic spores that can be distributed by wind, water, or insects.

Thousands of fungal species colonize wood, and they can be divided into three main groups: moulds, sapstain fungi, and decay fungi. Moulds and sapstain fungi are not a concern on utility poles because they do not attack the cell walls of the wood. Their impact is primarily aesthetic. The main cause for concern is decay fungi, which can be grouped into brown and white rot fungi and soft rot fungi. All three fungal types are capable of breaking down the lignocellulose complex that makes up the cell walls of the wood, causing structural weakening.

Brown Rot and White Rot Fungi

These decay fungi enter poles primarily through checks or bolt holes above the ground. They break down the lignocellulose by releasing enzymes from their hyphae. Brown rot fungi degrade cellulose and hemicellulose (the fibre), causing rapid and massive strength loss.

Because the fungi are unable to degrade lignin, the brown rotted wood contains a much higher proportion of lignin than normal wood and so darkens in colour to almost black in advanced decay. This brownish residue of lignin crumbles to a powder when dry, which has led to the widely-used term “dry rot”. However, dry rot refers to decay by a few specific members of the brown rot family, such as *Poria incrassata* and *Serpula lacrymans*. Unlike normal brown rot fungi, these species can transport moisture from wet wood to dry wood through several feet of rhizome-like structures. However, these “dry rot” fungi are believed to have a calcium requirement, so they are unlikely to be found in woodpoles.

White rot fungi can degrade lignin, but they do consume some cellulose. They tend to decay wood more slowly than brown rot fungi and also tend to be found more frequently in hardwoods than softwoods.

The growth of both brown rot and white rot fungi can be identified by a white or pale fluff or web over the wood that may be patchy, sheet-like, or fan-like. Fungal infestations are difficult to identify in the early stages because there are few obvious signs of colonization with little sign of discolouration. In stages of advanced decay, mushrooms, conks, or brackets growing from the wood provide recognizable evidence of a decay problem. Brown rot and

white rot fungi invade much more quickly than soft-rot fungi and may cause extensive damage before the infestation is visible.

Soft-Rot Fungi

These types of fungi tend to attack wood that is permanently moist (such as in soil); therefore they usually enter the below-ground portion of poles. They attack slowly from the outside of the pole to the inside and weaken the pole by softening the outer surface.

Soft-rot fungi attack both hardwoods and conifers and are generally more resistant to wood preservatives than the decay fungi.

There is little visual indication of soft rot except that wood fibre quality is greatly weakened. Under the microscope their presence is detected by bore holes in the cell wall and hyphal growth within the secondary layer of the cell wall. When dry, the wood can also show the cubical cracking associated with brown rot, although the cracking is often less severe.

Pole-top Decay

Pole-top deterioration is caused by both fungal decay and weathering action. When decay causes depressions on the top of the pole, collected rainwater will cause the wood fibres to shrink and swell during freeze and thaw. Checks develop that eventually allow moisture and decay spores to travel beyond the original treatment (more so through untreated wood) and break down wood fibres. When neglected, severe decay will necessitate the replacement of otherwise sound poles.

The indications of pole-top decay are gradual deterioration of the outer circumference of the top and indentations in the roof. The extent of the decay can be assessed fairly well from the ground using binoculars, but in some cases a closer inspection (bucket truck or climbing) is required. Typical decay patterns are illustrated in the photos on page 3 of the standard ES-64-B-08.04.

4.7 Evaluating Work

See Standard ES-64-B-07.12 for details.

Contract Inspections

All contract work will be inspected to ensure it is completed as per the Woodpole Maintenance Standards, the PMP, and the Pesticide Use Standards. This includes ensuring that contractors are carrying required permits and approvals (see Standard ES-64-B-07.12)

The pole maintenance inspector/coordinators will also review the quality of the applicators' work, up to 10% of the total number of poles completed. In addition, any safety, social, or environmental issues noted will be brought to the attention of the contractor immediately.

Typically, the BC Hydro Test & Treat manager or inspector will witness each applicator's work in the field at least once per month (or more frequently if the contract specifics dictate). The Pest Management Biologists or Vegetation Management Specialists will complete at least one inspection of a contract to make sure that permit or PMP conditions are being met, and to check on environmental protection measures, such as NTZs around domestic well and water intakes.

Two types of inspections are carried out during the contract: safety and environment inspections, and inspections of the technical elements of woodpole inspection and treatment.

Internal Audits

Environmental Audits are carried out by BC Hydro (Internal) Audit Services to provide assurance to the Board of Directors that the organization's environmental risks are being managed effectively. Environmental Management System (EMS) audits are conducted on each relevant business unit within a three-year recurring audit cycle. In addition, issues based audits to review specific environmental risks may be conducted at the request of executive management.

Pest Management Biologists or Vegetation Management Specialists will complete periodic audits to examine broader environmental aspects of the PMP.

Pest Management Biologists or Vegetation Management Specialists will also conduct periodic internal audits on contractor usage of wood preservatives and inventory of products in chemical storage containers. BC Hydro maintains several containers around the province. For each contract, the total quantity of product required is delivered to that container. Hydro then records the amount into a log and administers delivery of the product from the container to the contractors.

Chapter 5
Treatment of Woodpoles

This chapter covers the various wood treatment methods used by BC Hydro for woodpoles, including:

- external paste treatments (bandages)
- internal liquid treatments (fumigants)
- internal solid treatments (rods)
- safety and toxicity
- stubbing woodpoles (non-chemical method)
- backfill, clean-up, and report
- wood preservative handling practices

5.1 Overview

Wood preservatives are used to treat exposed wood surfaces where it is important to prevent decay from wood rot or damage from wood-boring insects. This extends the in-service life of woodpoles. Also, preservative levels in poles decrease with age and eventually become ineffective, requiring re-treatment.

BC Hydro will use the principles of integrated pest management (IPM) to control wood rot and wood pests. IPM is a decision-making process that uses a combination of techniques to suppress pests, while incorporating social, environmental, and other values.

For woodpole use, Hydro uses IPM to consider factors such as raw material procurement, supply, purchase, transportation, storage, maintenance, and disposal. This ensures that BC Hydro makes balanced, well-informed decisions when it purchases and manages poles. Upon purchasing, each pole is assigned an identification number that allows its location and maintenance history to be tracked.

5.2 External Paste Treatments

See Standard ES-64-B-07.05 for details.

The groundline area of poles is most vulnerable to decay. The in-service life of poles can be extended by the application of wood preservatives to this part of the pole, in the form of bandages covered with preservative paste. All poles outside NTZ zones are bandaged if shell rot is encountered.

Procedure

Two types of bandages are currently used by BC Hydro—pre-made bandages and those made onsite using an oil-based wood preservative paste.

For site-made bandages, the bandage material is plastic-backed kraft paper. A measured thin layer of the wood preservative paste is applied to a measured portion of kraft paper with a trowel, to the manufacturer's recommended thickness. (Some contractors use a bandage maker device.) The bandage is placed against the outer edge of a pole, about 55–60 cm below the groundline, and stapled carefully to the pole just above the groundline zone. Soil is back-filled against the pole to help hold the preservative in place.

Site-made bandages contain a combination of copper naphthenate and sodium fluoride, or copper naphthenate with borax. The woodpole preservative paste is in direct contact with the wood after application and slowly migrates into the surface of the woodpole.

Pre-made bandages incorporate a liquid gel-type preservative containing copper naphthenate into a quilted absorbent material, sandwiched between plastic. Until the bandage is cut and placed on the pole, the preservative is essentially encapsulated.

The following diagram shows the size of the bandage and the part of the pole it covers.

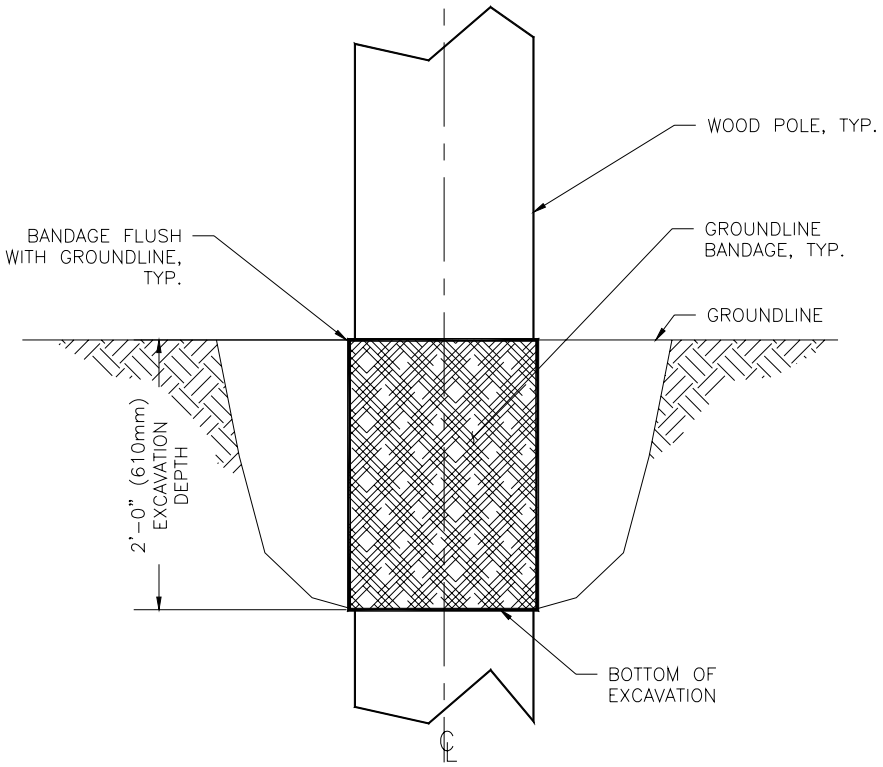


Figure 2: Completed Bandage Applied to Pole

Efficacy of Treatment

- The bandage is effective at arresting below-ground decay on the surface of the pole and/or preventing entry of fungi and insects into the pole.
- Copper naphthenate has limited penetration and stays close to the wood surface. Unlike internal treatments, it only travels a short distance in the sapwood region of the pole, about 10–50 mm. It will kill any fungi attempting to colonize the exposed wood, thus providing surface protection as well as an ability to eradicate interior decay.
- Copper naphthenate is oil soluble and resistant to leaching by rainfall.
- Sodium fluoride in bandages dissolves with moisture and migrates into the wood, providing enhanced protection to the wood away from the surface.

5.3 Internal Liquid Treatments

See Standard ES-64-B-07.04 for details.

All inspected poles are fumigated, whether there are signs of internal decay or not. Drill holes made during inspections act as early entry points for decay, so it is important to fumigate poles before decay begins, as an effective preventive measure. Drill bits are also used repeatedly without being sterilized, and could possibly carry pest organisms from pole to pole.

If the pole is located within a NTZ, the pole will only be tested.

Internal liquid treatments consist of injecting the liquid fumigant *metam sodium* into the woodpole to prevent fungal growth and insect damage.

Liquid insecticide solutions containing *disodium octaborate tetrahydrate* are occasionally used internally to control wood-destroying insects, such as carpenter ants, termites, beetles, and decay fungi. Internal insect treatment serves to prevent and arrest internal insect infestation and fungal decay.

Procedure

Metam Sodium

Applicators drill five holes in the pole about 40 cm deep. Using a low volume pressurized sprayer wand attached to a 5-litre canister, the holes are filled with a total of 0.5–0.7 litres of liquid fumigant per pole. The holes are then sealed with plastic plugs.

Liquid fumigant is placed only in sound wood, except in the case of carpenter ant treatment. When carpenter ants are detected the pole is treated above and below the gallery with solid treatment and the gallery itself is treated with liquid fumigant.

Where previously drilled and sealed holes exist, the plugs are removed with a tool or drill. Further drill holes are not drilled in the pole except to assess shell thickness.

Disodium Octaborate Tetrahydrate

A number of holes are drilled in the sound wood of a pole near the insect colony and a solution of *disodium octaborate tetrahydrate* is injected under low pressure into these holes. The holes are sealed with a plastic plug.

The product penetrates into the wood to various depths, depending on the moisture in the wood and the wood species. When the insect eats the wood containing the preservative product, they are controlled.

Efficacy of Treatment

Internal treatment serves to prevent and arrest internal fungal decay or to exterminate insects.

Metam Sodium

After the holes are sealed, and in the presence of acidic wood and moisture, the liquid fumigant turns into a gas—*methyl isothiocyanate* (MITC), the active fungicidal ingredient. Almost immediately, it rapidly dissipates through the wood. The fungicide moves vertically above and below the application point (with a small amount of lateral movement), which makes the treatment very effective against internal decay.

Disodium Octaborate Tetrahydrate

When products containing disodium octaborate tetrahydrate are placed into woodpoles, they control the spread of insect colonies and restrict the spread of decay. The reservoir of liquid preservative stays intact until moisture in the pole exceeds 30%, then the boric acid diffuses through the pole to the areas with the highest moisture contents, i.e., the areas most likely to be attacked by fungi or insects. If the moisture content is too low to permit fungal attack, the moist treated wood remains undisturbed.

Boric acid is toxic to fungi and insects such as carpenter ants, disrupting their digestive system.

5.4 Internal Solid Treatments

Internal solid treatments consist of inserting a preservative into the woodpole to prevent fungal growth and insect damage. This can be applied using:

- solid boron rods containing *anhydrous disodium octaborate*
- solid copper rods containing *anhydrous disodium octaborate*, copper, and boric acid in combination

Procedure

Applicators drill five holes in the pole about 40 cm deep and insert solid preservatives in the form of solid rods into the holes. The holes are then sealed with plastic dowels.

Rods can only be placed in sound wood.

Where previously drilled and sealed holes exist, the plugs are removed with a tool or drill. Further drill holes are not drilled in the pole except to assess shell thickness.

Efficacy of Treatment

Rods contain anhydrous disodium octaborate and may contain anhydrous disodium octaborate, copper, and boric acid. All products form boric acid upon reaction with moisture. The rods stay intact until moisture in the pole exceeds 30%, then the boric acid diffuses through the pole to the areas with the highest moisture content, i.e., the areas most likely to be attacked by fungi or insects. If the moisture content is too low to permit fungal attack, the solid rods remain undisturbed in the wood.

Boric acid is toxic to fungi and insects such as carpenter ants, disrupting their digestive system.

Both types of rod are effective in northern regions as a supplement to other preservatives, or in the southern interior where it is dry. They don't last as long in wetter areas, such as the Lower Mainland or Vancouver Island. Even so, efficacy lasts for about eight years once the rods dissolve.

5.5 Safety and Toxicity

Poles are treated by certified pesticide applicators, so there is little risk of misapplication, over-application, or spillage. All applicators carry spill kits with them.

Techniques have been developed to ensure that the product is placed carefully inside the pole (with holes sealed after insertion) or sealed securely against the pole below the groundline. Because of this placement, the public or wildlife will not come into contact with the wood preservatives, and the risk of wood preservatives leaching into the soil or air is virtually eliminated. Wood preservatives also bind to the wood, further reducing the risk of leaching.

When used properly, wood preservatives pose no hazard to eyes, skin, or lungs. However, in large quantities these products can be harmful to plants or animals. Workers handling wood preservatives will use all necessary protective clothing and equipment, according to what is recommended on the *Material Safety Data Sheet* for that product. This usually involves eye and skin protection, at a minimum, and often a respirator.

Worker and Public Safety

Copper

Copper naphthenate has been used as a wood preservative for over 50 years and has a proven track record of safety. It is considered far safer than other products such as creosote or pentachlorophenol.

Copper naphthenate is available to the public in retail stores and is used as a wood preservative in greenhouses and for textiles such as tents, awnings, and rope. It is also used in some topical medicines for horses and other animals.

Sodium Fluoride

Sodium fluoride is added to many brands of toothpaste to help prevent tooth decay. Many Canadian communities fluoridate their drinking water supplies for the same reason.

Wood preservatives contain sodium fluoride in larger quantities, however. Although it is not considered a carcinogen, it is very irritating to the eyes, may irritate skin and lungs, and is fatal if ingested.

Boron / Borax / Boric Acid

Boric acid and borax are forms of boron, which occurs naturally in the environment. It is an essential element in plant growth and is found in the foods we eat. It is also used in detergents, soap, fiberglass, ceramic glazes, topical antiseptic, and many other products.

Boron is of low toxicity to humans and when used properly, it poses no hazard to eyes, skin, or lungs.

The main risk from boron rods is choking. If swallowed, sharp edges could cause internal damage.

Metam Sodium

Metam sodium is of low toxicity to humans, but it can irritate the eyes, nose, throat, and skin. In addition to eye and skin protection, a respirator should be worn when decanting the product or cleaning up a spill.

The containers that BC Hydro uses for metam application significantly reduce potential for spills of the product. Contractors must have their applicator bottle inside a bucket, which further reduces potential for spills. Also, the hole is sealed with a plastic plug to seal the product inside the wood.

Effects on Fish and Wildlife

Copper

The effects of copper naphthenate on soil are local, temporary, and far below levels considered hazardous. It is not soluble in water and therefore resists leaching due to rainfall. It does not evaporate into the air.

Sodium Fluoride

Rocks, soil, water, air, plants, and animals all contain fluoride in widely-varying concentrations. However, the large amounts of sodium fluoride present in wood preservatives are toxic to fish and wildlife, so workers must

be careful not to release this product into the environment. Sodium fluoride products should not be applied to poles that are in standing water. In normal use as a wood preservative, this product will not leach into the soil or air.

Boron / Borax / Boric Acid

Boric acid and borax are forms of boron, which has a very low mammalian toxicity (similar to that of Aspirin) and is virtually benign to most aquatic life. The Ministry of Water, Air and Land Protection (MWLAP) allows only boron rods to be used in riparian areas, and no other type of wood preservative.

Disodium octaborate tetrahydrate should not be applied near waterbodies as it can be toxic to some aquatic species. Workers must be careful when cleaning equipment to ensure that no rinseate enters water or wetlands.

Metam Sodium

Metam sodium has a long history of safe use in remedial treatment of woodpoles. Since it moves vertically in the pole with virtually no sideways movement, there is little risk that the metam sodium will move to the surface of the pole and escape.

Metam sodium is of low toxicity to mammals. However, it is toxic to fish and must not be applied to water or wetlands. Workers must be careful not to contaminate waterbodies when cleaning equipment or disposing of waste.

In the past, BC Hydro purchased metam sodium in 4-litre containers that were discarded, but in the 1990's, Hydro developed its own container re-use program. The product is contained in 10-litre reusable jugs, which are cleaned and reused. The risk of spills from these containers is low because they are very tough and the containers are regularly inspected.

5.6 Stubbing Woodpoles

See Standard ES-64-B-08.01 for details.

Stubbing is the reinforcement of the groundline area of a woodpole using a relatively short reinforcing column, or stub, fastened to the pole. Stubs are made of either wood or steel.

Efficacy of Treatment

The main objective for stubbing woodpoles is to delay replacing the pole for several more years (15–25 years), thereby saving costs and trees.

Stubbing is an alternative to, and is cheaper than, pole replacement. Typically, replacing a pole is several times more expensive than stubbing.

Steel stubs are not as conspicuous as wood stubs and require less maintenance. However, they require specialized stub-driving equipment to install. Steel stubs have very little bearing surface, therefore, their application is limited to areas where the ground is firm enough to hold up the pole. If the pole is in unstable ground (marshy, wet), a wood stub or extra-long steel stub will be used.

Safety and Environment

Stubbing involves no adverse effects on the fish, wildlife, or the environment, and no hazards to workers or the public, other than the use of power tools by workers.

5.7 Backfill, Clean-up, and Report

After inspection or treatment, the applicator will backfill and firmly tamp the excavated hole around the pole. The applicator will be careful not to backfill loose articles, turf, garbage, or broken asphalt. Bandages shall be protected from damage with a shovel during the backfill.

Upon completion of the woodpole maintenance, the applicator will install the contractor's identification tag under a date nail. Finally, the applicator will clean up the site, remove broken pavement and debris, and complete reporting requirements.

5.8 Wood Preservative Handling Practices

See Standard ES-64-B-07.08 for details.

General information on wood preservative handling practices is contained in the Pesticide Use Standards system, which forms part of this PMP. The following topics are covered there:

- licensing and certification
- purchasing
- storage
- transportation
- mixing and loading
- disposal
- spill prevention
- spill response
- personal protective clothing and equipment
- pesticide poisoning and first aid
- weather monitoring
- equipment maintenance

The following specific practices apply to wood preservatives.

Installation and Maintenance

- Pole installation is governed by provincial and BC Hydro standards and guidelines. Poles are installed away from sensitive areas, within required constraints. Efforts are made to minimize site disturbance during installation.
- Preservatives will not be applied to poles nearby watercourses. A copy of this PMP must be carried at all times.
- Since treatments are usually internal or below ground, most applications are not exposed to the elements. However, whenever possible, wood preservatives will be applied when temperatures are less than 30^{o}C.
- If water fills the excavation during below-ground treatments, no preservatives will be applied.

Disposal

- The disposition of poles removed from service is governed by Hydro's *T&D Out-of-Service Pole Management Guidelines and Procedures*. If poles are structurally sound they may be reused. If not, sound portions of them may be removed and reused.
- Poles that cannot be reused are recycled at BC Wood Recycling, a BC Hydro supported, value-added, woodpole recycling mill. At the mill, old woodpoles are turned into fenceposts and Adirondack chairs.

- Upon removal from service, pole identification tags are removed and inventory records reconciled.

Refilling Metam Sodium Containers

- Damaged containers are not rinsed because it is impractical to do so as outlined in the *Waste Management Act* and *Special Waste Regulation* (external links).
- All metam sodium containers are returned, unrinsed, to BC Hydro's Contaminated Waste Disposal Facility, where they are either returned to the manufacturer for refilling or disposed of. Refillable containers are not rinsed prior to shipping because contamination may result.

Chapter 6
Wood Structures at Facilities

BC Hydro manages hundreds of facilities throughout the province. A BC Hydro facility is a well-defined site, owned or leased by BC Hydro. It usually consists of electrical structures and buildings, and typically has limited public access. Most facilities are constructed of concrete and steel, not wood.

The majority of facilities are substations, which receive high-voltage electricity from transmission lines, and reduce the voltage to an appropriate level for distribution to Hydro customers. Substations consist of a system of transformers, circuit breakers, and other high voltage equipment installed outdoors. BC Hydro has about 330 substations throughout the province.

This chapter covers:

Note: Chapters 2 and 3 of this PMP should also be used in conjunction with this chapter.

6.1 Types of Wood Structures

Types of facilities that may have wood structures include:

- electrical facilities — substations, switchyards, capacitor stations, and cable termination sites.
- generating facilities — hydroelectric (which consist of dams, reservoirs, diversion canals, spillways), thermal, diesel, and gas turbine.
- communication and data collection facilities — microwave sites, repeater stations, and data collection sites.
- transportation facilities — access roads, bridges, and helipads.
- administration and works facilities — office buildings, storage yards, and pole yards.

Duct bank/trench covers, walkways, ramps — In substations and other facilities, underground ducts house a variety of equipment including cables and conduit. Although many of these ducts are covered with concrete pads, some are still covered with wooden pads. A variety of wooden ramps are used at facilities, including equipment loading and wheelchair access ramps. These wooden structures need to be protected from decay.

Fence, sign and landscaping posts, timbers, ties, etc. — Many facilities are fenced, landscaped, or have signs on site. Many of the fence posts, landscaping timbers, and signposts are wooden. The wooden components need to be protected from decay.

Helicopter landing pads, communications structures, and bridges — On certain difficult-to-access powerline corridors, helicopter access is the only reasonable means of transportation. On these sites, and where terrain is uneven, landing pads are built to allow helicopters to land, drop off supplies and passengers, and to take off. Where vehicle access is possible, BC Hydro may maintain wooden bridges. The wooden components on both helicopter landing pads and bridges need to be protected from decay.

Buildings — Wood preservation may be required for wooden components of buildings (however, this PMP does not cover the direct management of insects and rodents in buildings).

Wood Staves — These are *not* covered under this PMP. The treatment of wood staves is a large, infrequently occurring project, and each wood stave has unique environmental concerns. Separate Pesticide Use Permits for the treatment of wood staves will be obtained on an as-needed basis.

6.2 Control Methods and Treatments

BC Hydro will use the principles of integrated pest management (IPM) to control wood rot and wood pests. IPM is a decision-making process that uses a combination of techniques to suppress pests, while incorporating social, environmental, and other values.

BC Hydro uses the following integrated pest management methods for treatment of wood structures:

- external preservative treatment (bandages and surface brush application using copper or zinc as an active ingredient).
- internal preservative treatment (using a liquid fumigant or solid rod)

The following active ingredients in wood preservatives will be used for wood structures under this PMP:

- elemental copper (copper naphthenate)
- zinc naphthenate (Nuodex)
- borax

Products may have either domestic or commercial registration.

6.3 Prevention

Planning the construction and using a 'built to last' principle allows for wood structure designs that prevent organisms from becoming pests. At BC Hydro, wood structures are built with quality wood from the start to extend the life of the structure. This includes the use of decay-resistant cedar and pressure-treated lumber.

During construction, pressure-treated lumber may be pre-treated with a wood preservative by brushing or dipping. This is the most common use of wood preservatives on wood structures at BC Hydro's facilities. Painting the cut ends of treated wood at the time of construction can extend the service life of wood structures by 20%.

Wood destruction from fungi is also minimized by good building practices.

Generally, insects will attack damp rotting wood or wood in contact with the ground. Insects can be discouraged by eliminating decayed wood. Once wood has dried below a 20% moisture content, it will not be subject to fungal decay. Under exterior uses, very little decay occurs if the wood dries reasonably quickly after being wet. However, fungal decay will occur when wood is in contact with the ground, or contains cracks or grooves that hold water for prolonged periods.

6.4 Monitoring, Identification, Action Levels

Identification of potential problems with wood structures is done monthly during facility safety inspections. (To identify pests, see the *Identification* section in Chapter 4, IPM Program for Woodpoles.)

Monitoring of pest occurrence and damage, as well as environmental conditions, occurs annually during major safety inspections.

Action levels are related to engineering principles. The amount of sound wood remaining must be suitable to bear the load acting upon it, or it is considered unsafe. If wooden structures are built to engineered specifications, little rot is tolerated to maintain the structural integrity of wood. The action level is determined during safety inspections by qualified professionals.

If treatment is required to reduce pests, a decision is made to either maintain the wood structure using wood preservatives, or replace the structure.

6.5 Treatment

At electrical facilities, the use of wood preservatives is incidental and not part of the woodpole Test & Treat program. Most treatment is not remedial.

Some wooden structures at BC Hydro's facilities typically use large timbers and are very expensive to replace; therefore, they warrant maintenance to further extend their service life. Examples of these structures include wooden bridges, guard rails, sign posts, and retaining walls and cribs. The ‘built-to-last' approach is always implemented to maximize the service life of these structures; however, follow-up treatments can extend it even further, by two to three times.

Remedial treatment of wood structure surfaces employs applications of brushing grade wood preservatives containing copper naphthenate or zinc naphthenate, or internal application of boron rods. (For details on treatment, efficacy, safety, etc., see Chapter 5, *Treatment of Woodpoles*.)

Many of the wood structures at BC Hydro's generating stations are located near water. The approved No Treatment Zones in Chapter 3 will be adhered to. In addition, to prevent wood preservatives from contaminating sensitive areas, drop sheets will be used under structures undergoing surface applications.

Wood preservatives will be applied by certified pesticide applicators, or under the direct supervision of a certified applicator in the structural wood category.

Evaluation of treatment efficacy is undertaken during safety inspections.