INDUSTRIAL HYGIENE REPORT

PRELIMINARY SURVEY OF WOOD PRESERVATIVE TREATMENT FACILITY

at

PERMAPOST PRODUCTS COMPANY
HILLSBORO, OREGON

Survey Conducted by
Stewart-Todd Associates, Incorporated

on

June 25, 1979

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A walk through survey was conducted at Permapost Products Company (SIC-2491), Hillsboro, Oregon in June, 1979. Area air monitoring for pentachlorophenol (87865) was conducted using a NIOSH method and a silica gel tube technique. The facility treated prefabricated bridge structures, playground equipment, picnic tables, and other specialty items with pentachlorophenol or chromated copper arsenate. The facility had no formal medical monitoring program. Audiometric testing was performed annually on a contract basis. The company utilized the local hospital emergency room, located 5 minutes away. Work practices, processing methods, and protective equipment such as cartridge half face respirators, elbow length gloves, and impervious aprons were used to control exposures to the wood preservatives Pentachlorophenol concentrations ranged from 0.25 to 0 51 milligram per cubic meter (mg/m3) using the NIOSH method and from 0.20 to 0.26mg/m3 with the silica gel tube method. The authors note that since they took only a small number of samples, a meaningful comparison of the two analytical methods cannot be made.

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PURPOSE OF SURVEY;	This walk-through survey was conducted as a part of the Phase II study of the INDUSTRIAL HYGIENE ASSESSMENT OF NEW AGENTS - III, NIOSH Contract No. 210-78-0060. Specifically, this survey was for the first group which includes all agents used in wood preserving. This facility was selected on the criteria set forth in the Study Proposal based on information gathered in Phase I.
EMPLOYER REPRESENTATIVES CONTACTED:	Adrian Kinsella, Vice President of Manufacturing Herschel Rowton, Plant Manager Roger Bond, Assistant Plant Manager (503)-648-4156
EMPLOYEE REPRESENTATIVES CONTACTED:	Non-union
ACKNOWLEDGEMENTS:	James L. Oser, NIOSH Battelle Columbus Laboratories (Richard E. Heffelfinger, Ph.D.)
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	SIC-2491

ABSTRACT

A preliminary survey of the Permapost Products Company, Hillsboro, Oregon, wood treating plant was done in partial fulfillment of obligations to NIOSH under contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III."

The field site visit of June 25, 1979 provided background information and familiarization with both current and past process methods and materials used for treating wood products. Control methods or procedures, in addition to work practices used to eliminate or reduce exposures in the treating plant, were discussed and observed. Past and current employee training efforts and historic exposure data were reviewed along with descriptive information on medical examinations and biological monitoring. Range finding general air sampling was conducted during the dayshift operation.

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INTRODUCTION

Stewart-Todd Associates, Incorporated, in conjunction with the National Institute for Occupational Safety and Health, under Contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III," conducted a preliminary industrial hygiene survey at Permapost Products Company, Hillsboro, Oregon, June 25, 1979. This plant was selected on the basis of geographical location, size, and diversity of processes utilized as ascertained during Phase I of the Wood Preservatives investigation. It is representative of one of the West Coast treating facilities which pressure treat with three basic wood preservative systems.

The purpose of the preliminary survey is to gain familiarity with process methods, potential or known exposure conditions, and test sampling methods and determine the need for comprehensive field investigations to evaluate long-term health effects associated with these types of plant operations. The information obtained through this research effort will be utilized in the form of technical reports on the wood preservative industry.

DESCRIPTION OF THE FACILITY

The wood processing and treating plant was originally constructed and began production in 1961 on the ten acre tract of land at the present Hillsboro location. At that time the 4 x 50 foot cylinder was used for all treatments. A second pressure treating cylinder, 6 x 50 feet, was added in 1966.

The treatment facility, per se, includes the treater building, bulk storage tanks, and adjacent yard area where the wood is stacked in bundles in preparation for treatment, and treated wood is stored prior to shipment. The control room, pumps, valves, and mixing equipment are located in the treater building at the end of the cylinders. The plant also has a storm water run-off and water treatment area consisting of an oil separator and evaporation pond.

Other buildings on the plant property include those used for wood preparation; i.e., incising, cutting, shaping and drilling, and lumber fabrication. Two of these structures have been added since the plant startup, one in 1972 and one in 1975.

Bridge structures, playground equipment, picnic tables, light standards, and other speciality items are prefabricated to customer's specifications prior to treatment.

DESCRIPTION OF WORK FORCE

Currently 50 people are employed in the plant. Twenty of these are in the production areas fabricating specialty lumber products and preparing the wood for treatment. They work a typical 5-day week of 40 hours. The treatment plant is operated around the clock on three shifts, 5 days a week, with a single operator on each shift and one supervisor who works on day shift. The treater operator is assisted by yard personnel in loading and unloading cylinders and moving treated lumber as needed during the day. A watchman is the only other person at the plant site during evenings and night shift.

The treater is responsible for maintaining the pressure cylinder treatment conditions and records, as well as mixing or diluting the treatment chemicals. He also handles limited maintenance tasks, such as seal or pump leaks. Major repair work on the treatment equipment would be done with his assistance or supervison.

None of the plant employees are currently unionized. There are no women employed in the treatment plant, per se, but both female office employees and one production employee may be occasionally in proximity of freshly treated wood. None, however, are involved in handling it or assisting in the cylinder loading and unloading tasks.

DESCRIPTION OF PROCESS

Sawed wood for treatment is purchased from other companies and cut to dimension, drilled and incised, shaped and, in some cases, prefabricated in the production buildings. Three basic preservative systems are used for treating the wood products, depending on their end-use and/or customer's specifications.

Copper-8-quinolinolate is used for the treatment of wood for picnic tables and truck beds where indirect food contact is anticipated. It cannot, however, be used for ground contact purposes since it only has anti-fungal properties. A 5% solution in mineral spirits is used for treating at ambient temperature and the treatment cycle varies, depending on the thickness of the lumber, from 8-10 hours. Copper-8-quinolinolate concentrate is purchased from Seymore Chemicals, Chicago, in 55-gallon drums and contains 10% Copper-8-quinolinolate and 10% nickel-2-ethylhexanoate in solvent. This method of treatment accounts for less than 5% of the total plant production.

CCA (chromated copper arsenate) treatment is commonly used for fencing, fence posts, and playground equipment. CCA Type C is purchased from Osmose Wood Preserving, Griffin, GA in 275 lb. drums as a 72% concentrate. It is diluted by the addition of water in a mix tank. After the lid is cut off, the drum is inverted, flushed out into the mix tank and disposed of through contract services. The final diluation to 2% use strength is made in the storage tank. CCA treatment is performed at ambient temperature.

Pentachlorophenol (PCP) is used as a 5% solution in three solvent systems. For heavy bridge timbers and similar wood products, a heavy oil diluent, Type A, is used which permits boultonizing of the wood in the cylinder to remove excess moisture prior to pressure application of the PCP solution. This procedure can take up to 48 hours, depending on the thickness of the wood and its moisture content. This, in conjunction with incising, is used to provide relatively good preservative penetration in opened grained woods such as Douglas Fir and Western Pine. PCP, Type C, is diluted in mineral spirits and used for lighter lumber where less coloring is desired for aesthetic or other reasons. A third PCP system containing dissolved wax in the mineral spirits is used to give water repellant properties.

PCP Type A is purchased from Reichhold Chemicals in 1000 and 2000 lb. blocks which are placed directly in the cylinders and heated in heavy oil; the solution is then pumped to the storage tanks. The other mineral spirit PCP Type C mixtures are made

up from drums of concentrate received from Koppers Company. The concentrate is dumped into a 500 gallon mix tank, diluted to use-strength and pumped to storage.

Presently, the use of PCP and CCA treatments for lumber is about equivalent; i.e., 45-50% of annual production for each. However, recent economics have tended to favor CCA, as oil products become more scarce and costly.

The treatment process begins when the tram cars, loaded with bundles of wood or lumber, are pushed into the cylinder, the door is locked, and the cylinder is flooded with solution. The treating cycle varies from 2-16 hours, depending upon the specific type of wood and preservative solution and end-product use. At the end of the cycle, the treating solution is pumped to the storage tanks for later re-use. For the heated PCP Type A mixture, a vacuum is then drawn to remove most of the liquid and solution condensate, which occurred when the cylinder cooled down. The tram cars are withdrawn from the cylinder with a front-end loader and cable and stacked off on one side to dry. The treatment plant valving system is designed so that either of the cylinders can be used for any of the perservative materials.

An FCAP (Fluor-chrome-arsenate-phenol) treatment system was in use until about 1975 when it was discontinued. No other pressure or non-pressure treatment systems or equipment have been used in this plant.

In addition to wood preservation treatment, the cylinders are also used for flame retardant pressure treatments. Three different materials are currently used for interior building applications. They are received in bags or drums, dumped in mix tanks, and pumped to storage tanks for use as specified. Flame retardant treatment represents less than 5% of current annual plant production.

DESCRIPTION OF PAST EXPOSURES

This plant has been inspected by the Oregon state Workmen's Compensation Board. They observed mixing procedures and practices, but did not conduct any air monitoring. The company's compensation insurance carrier, Employee's Benefits Insurance, monitored wood treatment chemical exposures in the treatment building and on the fork lifts which are used to move lumber in and out of the cylinders. Their results, however, were considered invalid because of the analytical method used.

DESCRIPTION OF MEDICAL, INDUSTRIAL HYGIENE AND SAFETY PROGRAMS

The plant currently has no formalized medical monitoring program. Audiometric testing, however, is conducted annually on a contract basis. The company utilizes the local hospital emergency room, which is only five minutes from the plant, for treatment of occupational illnesses or injuries. To date, these have been primarily limited to back sprains, finger

injuries and similar accidents. No elaborate records are kept on these incidences beyond the OSHA reporting form. Accident records are documented with the insurance carrier, Employee Benefit Insurance. The plant management indicates there has been no documented experience of occupational illness or dermatitis related to the use of wood preservatives or flame retardants. Pre-employment and periodic medical examinations are not done on any employees except for the annual hearing tests already mentioned.

The plant has no formal industrial hygiene program. Exposure controls to the wood preservatives are primarily through work practices, processing methods, and the utilization of protective equipment when needed. Airborne exposures are also minimized by pulling vacuum on the cylinders at the end of the treatment cycle to remove the residual solutions from the wood surfaces.

Organic vapor, acid mist, dual cartridge half-face respirators are used by the treating operators when removing hot, PCP treated wood from the cylinders and in other instances such as leaks or spills. Each treater has his own respirator which is stored in a closed container in the control room. Cleaning and routine maintenance of the respirators are the responsibility of each employee issued the respirator. No formal training program or respirator fit-testing has been conducted. The use of the respirator is at the discretion of the treater

and may be influenced by wind direction and his estimates of possible exposure while removing the treated wood from the cylinders. Since the cylinders are located in the open, favorable wind direction and velocity might be expected to significantly alter his exposure.

Elbow-length gloves are issued to treating personnel for handling freshly treated wood and making up treatment batches. Face shields and impervious aprons are required when handling CCA concentrate and making up solutions in the mix tanks. An emergency flood shower and eyewash fountain are located within 40 feet of the treating cylinder and 20 feet of mix plant. Currently, neither hardhats or eye protection are required in the treating area of the plant for routine activities.

All lunch and coffee breaks are taken in a separate lunch room adjacent to the administration building. Street clothing is worn by the treaters and production personnel. There is no formal clothing change policy and uniforms are not provided. Soiled street clothing is laundered at home. Washup at break-times and when leaving the plant are encouraged, but not required. Shower facilities are not available for cleanup at the end of the shift.

All occupational safety and health matters are handled by Mr. Adrian Kinsella. He informs the employees both on initial employment and a continuing basis of the nature of the hazardous materials and tasks related to the treatment process. In addition, he determines the protective equipment needs for the various plant operations and maintains the OSHA log of injuries and illnesses.

INSPECTION OF THE PLANT

An industrial hygiene walk-through survey of the treatment facility was conducted following the preliminary discussions with plant personnel. Mr. Adrian Kinsella provided the basic description of the treatment equipment and process flow. Personal protective gear and supplies were examined along with a review of employee work practices and personal hygiene.

Area air monitoring was conducted in the treatment building adjacent to pumps and valving used for the large treating cylinder which contained PCP on the day of the survey. The air concentrations measured are representative of average operator exposures during a typical treating cycle when working in the treatment building. However, generally the operators spend relatively short periods of their work day in this area unless there are pump leaks or equipment problems which would require additional time for correction. During most of the shift they are in the control room or outside assisting with cylinder loading and unloading and mixing treatment chemicals.

Air sampling was conducted during the removal of the PCP treated wood from the cylinder. General air samples were taken with samplers positioned on the hinge of the cylinder door and on a hot bundle of treated wood that was moved to the side yard for cooling.

Visible fume and steam emissions were observed when the cylinder door was opened and there was a distinctive PCP odor downwind of the unloading operation. The treating engineer wore an organic vapor cartridge respirator and gloves during most of the unloading tasks. The treating supervisor and yard crew who were assisting in removal of the treated wood from the tram cars also wore gloves when handling the car cable, bundle strapping, and removable track section at the cylinder door. The tram cars are unloaded directly in front of the cylinder since there is no side track on which to place them while cooling, in order for the cylinder to be reloaded, the door closed and the next cycle begun. The employees performing this task are, therefore, potentially exposed to the PCP emissions generated by both the hot wood and the residual material in the cylinder for the time required for unloading. Depending on wind direction and possible problems which could occur during wood removal, exposures can vary considerably from one treatment cycle to the next. The data obtained does not reflect actual employee occupational exposures and because of the limited numbers of samples taken are only estimates of possible short-term peak exposures if respirators were not utilized or properly worn.

DESCRIPTION OF SURVEY METHODS

The recommended NIOSH impinger sampling and analytical procedure S-297 and a silica gel adsorption method were used for collecting airborne PCP. These samples were collected, side by side, in order to evaluate and compare both methods. Bendix BDX-41, MSA Model S, and Bendix C-115 air sampling pumps, pre- and post-calibrated with a Universal Pump Calibrator, Model 302, were operated at flow rates of approximately 1.5 liters per minute (LPM) for the NIOSH impinger method and 0.5 LPM for the silica gel tube.

The sampling train for the NIOSH method included a prefilter of a 0.8 micron Millipore Type AA filter supported by a stainless steel screen in a three-piece cassette connected in series with a midget bubbler containing 15 ml of ethylene glycol. This was followed by a second empty midget bubbler used as a trap to protect the sampling pump from solvent splashover or condensation. When the sampling period was completed, the filter was removed from the cassette and added to the bubbler of ethylene glycol in order to prevent sublimation of any of the collected PCP. The samples were analyzed by high pressure liquid chromatography using an ultraviolet detector. The lower limit of PCP detection by this method is 12.5 micrograms per sample.

PCP collected on large size silica gel tubes (260/520 mg) were desorbed with 10% methanol in diethyl ether and analyzed using gas chromatography and a flame ionization detector. The lower limit of detection by this analytical method is 0.033 micrograms of PCP per sample. One of the three samples collected by this method also included a 0.8 micron Millipore AA prefilter in a three-piece cassette which was added to determine if there was any airborne particulate PCP. At the end of the sampling period this filter was removed from the cassette, submerged in a jar containing ethylene glycol and later analyzed by the NIOSH method.

RESULTS

The set of air samples collected at the cylinder door while the tram cars were removed from the cylinder and the treated wood unloaded showed PCP concentrations of 0.51 milligrams per cubic meter (mg/m^3) by the NIOSH sampling and analytical method and 0.20 mg/m^3 by the silica gel method. PCP levels in the treatment building were below the limit of detection and less than the blank value for the respective NIOSH and silica gel methods. Therefore, based on the air sample volumes taken, calculated air concentrations would be less than 0.03 mg/m^3 for the NIOSH method and less than 0.0003 mg/m^3 for the silica gel tube. Samples taken on top of the hot treated wood which had been moved into the yard area for cooling were 0.25 mg/m^3 by the NIOSH procedure and less than 0.26 mg/m3 by the combined silica gel/prefilter method.

ANALYSIS AND DISCUSSION

The sample results obtained for the treatment building represent average exposure levels for the treater when he is working in this area during routine operating conditions. The airborne levels were below the limits of analytical detection for both monitoring procedures.

Sets of samples were collected at the cylinder door and on the stack of hot wood. The sample taken at the cylinder door was left in place for 49 minutes with the prevailing wind blowing the steam across the sampler. The second sample was placed on top of the fresh treated wood and left for 91 minutes. Workers would experience these exposures for brief periods of time since the operation is outside. For these brief exposure periods, workers should be provided with respiratory protection. It should be noted that these samples were taken primarily to evaluate methods and not to evaluate worker exposure. The samples taken at the cylinder door by the NIOSH method were 2.5 times higher than the silica gel results indicating possibly a poor correlation between the sampling and analytical procedures. The other set of sampling data cannot be validly compared since the silica gel/prefilter results were below the analytical detection limits.

In summary, due to the small number of samples taken and the fact that three of six sample results showed levels below the limits of detection for PCP, a comparative evaluation of the monitoring methods cannot be made with this data alone.

PERMAPOST PRODUCTS COMPANY — APPENDIX A — NIOSH CONTRACT No.210-78-
Hillsboro, Oregon — AIR MONITORING RESULTS- PRELIMINARY WALK-THROUGH — Survey Date: June 25, 19

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION Mg/m^3
Area Sample on hinge of cylinder door after door was opened on Penta tank. Steam and fume emissions observed; pumps were downwind of the emissions for part of the sampling period	#1-MSA Bubbler Prefilter NIOSH Method PERM-02	2:01p-2:50p 49 min.	1.52 LPM 0.074 m^3	Pentachlorophenol	38	0.51
	BDX-82 Silica gel PERM-01	2:01p-2:50p 49 min.	0.53 LPM 0.026 m^3	Pentachlorophenol	5.24	0.20
Area sample in treatment building adjacent to pumps and valving used for large treating cylinder.	#2-MSA Bubbler Prefilter NIOSH Method PERM-04	11:56a-3:53p 237 min.	1.60 LPM 0.380 m^3	Pentachlorophenol	< 12.5	< 0.03
	BDX-124 Silica gel PERM-03	11:56a-3:53p 237 min.	0.47 LPM 0.110 m	Pentachlorophenol	< 0.033	< 0.0003

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APPENDIX A

PERMAPOST PRODUCTS COMPANY AIR MONITORING RESULTS - PRELIMINARY WALK-THROUGH Survey Date: June 25, 1979
Hillsboro, Oregon NIOSH Contract No. 210-78-0060

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION Mg/m^3
Area sample on stack of treated wood after removal from cylinder and tram car. Wood had been moved to side storage yard. Fume and/or steam emissions were observed during the entire sampling period.	#1-C-115 bubbler prefilter NIOSH Method PERM-07	2:29p-4:00p 91 min.	1.49 LPM 0.135 m^3	Pentachlorophenol	33.5	0.25
	BDX-116 prefilter PERM-06	2:29p-4:00p 91 min.	0.53 LPM 0.048 m^3	Pentachlorophenol	<12.5	
	Silica gel PERM-05			Pentachlorophenol	< 0.033 / < 12.533	< 0.26
Silica gel blank				Pentachlorophenol	0.56	
NIOSH blank				Pentachlorophenol	< 12.5	

(The blank values were subtracted from the individual sample results prior to calculating air concentrations and µg quantities as they appear in the table have been corrected.)