INDUSTRIAL HYGIENE REPORT

PRELIMINARY SURVEY OF WOOD PRESERVATIVE TREATMENT FACILITY

AT

Cascade Pole Company
McFarland Cascade
Tacoma, Washington

Survey conducted by
Stewart-Todd Associates, Incorporated
Wayne, Pennsylvania

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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:	Charles Stoddard, Vice President and Technical Director, McFarland Cascade Co., Sandpoint, Idaho (208) 263-2141. Les Lonning, Manager of Quality Control, McFarland Cascade. (206) 572-3033.
EMPLOYEE REPRESENTATIVES CONTACTED:	R. Gochley, Inter. Union of Oper. Eng. Local 612.
ACKNOWLEDGEMENTS:	James L. Oser, NIOSH Shiro Tanaka, M.D., NIOSH Harry Gee, LFE Corporation
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	SIC 2491 Wood treatment lumber & posts

ABSTRACT

A preliminary survey of the Cascade Pole Company, Tacoma, Washington was done as partial fulfillment of obligations to NIOSH under contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III." The field site visit of May 30, 1980 provided familiarization with current and past process methods and control procedures utilized to reduce exposure to wood preservation chemicals. Employee training, work practices, as well as general occupational educational efforts were evaluated along with any historical data on the plant processes and past experience from working with the treatment chemicals.

All air sampling for copper and arsenic from the ACA treatment process gave non-detectable results even though a water vapor plume was visible during cylinder opening. The limited air sampling for creosote at the top of the door during cylinder opening and on the freshly treated bundles of wood gave results which differed by the two methods of analysis on the same samples. While the values obtained are high, they do not reflect actual employee exposures since personnel are not stationed at these locations. Pentachlorophenol levels monitored during cylinder opening and on freshly treated wood showed concentrations below current occupational limits with both the impinger and silica gel sampling techniques.

Copper, chrome and arsenic analysis of wipe samples from dry treated lumber showed some surface salts present but to a greater extent on the ACA versus the CCA treated wood. These data suggest only possible skin contamination problems if the freshly treated wood is handled directly without gloves.

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INTRODUCTION

Stewart-Todd Associates, Inc. in conjunction with the National Institute of Occupational Safety and Health, under Contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III," conducted a preliminary industrial hygiene survey at the Cascade Pole Company, Tacoma, Washington on May 30, 1980. The plant processes and treats fence posts, guard rail posts, poles, and dimensional lumber. It was selected as representing a large diversified Western wood treating facility which uses Creosote, Pentachlorophenol (PCP), Chromated Copper Arsenate (CCA), and the Ammoniacal Copper Arsenate (ACA) processing methods.

The purpose of the preliminary survey is to gain familiarity with current and past process methods and potential or known exposure conditions; evaluate air sampling methods, and to determine the need for comprehensive field investigations to evaluate long-term health effects associated with CCA, ACA, PCP or creosote wood treatment. The information obtained through this research effort may be utilized in technical reports on the wood preservative industry.

DESCRIPTION OF THE FACILITY

The Cascade Pole company plant at the port of Tacoma, Washington is a division of McFarland Cascade, headquartered in Sandpoint, Idaho. The facility was built on the present site in 1973 and began treatment in 1974. Previously from 1937 to 1973 the plant operated on other property in the Tacoma area. It has a variety of wood processing and treating buildings, laboratory and administrative offices (total 14) on 46 acres. A majority of the property contains the raw material and finished product storage. Primary products of the treating plant are dimension lumber for guard rails, decks, bridges, etc. and utility poles and pilings. Most of the plant site and work force are utilized in processing raw logs or dimension lumber for air or kiln drying. Most, but not all the processed lumber is then treated before shipment.

In the wood treating area, there are two basic process buildings used for a control room; storage of chemicals and equipment; and preparation and blending of ACA solution. Storage tanks for all four treatment chemicals are adjacent to the process building and treatment cylinders. All four

cylinders are 8 feet in diameter and are outdoors. Cylinder A, nearest the central room, is 40 feet in length and is used for CCA (Kopper's licencee). B cylinder is 95 feet long and is used for 5% PCP in P-9 Type A oil. The Creosote cylinder (C) is 95 feet in length. The last cylinder (D) is 105 feet long and is used for ACA treatment. Cylinder D has a hydraulically operated door, the remaining three currently are manually opened with an air wrench. The tram cars carrying wood for treatment can be moved to any of the four cylinders by a motor driven platform immediately in front of the cylinders. Loading and unloading can be done sequentially with this system in relatively short time without moving tram cars any significant distance. Adjacent to the treatment building, there is a hydraulically operated butt dip tank for utility poles. Heated PCP oil from bulk storage is used for treatment. This equipment does not operate frequently and may be moved to another plant site for better utilization. The tank is approximately 20 x 20 with a treatment depth of 8 feet and can handle up to 150 poles 60 feet in length.

DESCRIPTION OF WORKFORCE

The plant employs 115 personnel, a majority of which are not in the wood treating areas. The hourly employees are represented by the International Union of Operating Engineers. The group includes 96 in the production areas, 15 administrative personnel, and 4 wood supervisors. The plant, for the most part, works a single shift, 5 days per week. The treatment facility operates three 8-hour shifts, typically 5 days per week. There are 6 treating plant operators (2 per shift), 6 pettibone and two fork-lift operators in addition to 2-4 yard crew who have potential exposure to most, if not all, the wood treatment materials.

The remainder of the production workforce is engaged in peeling raw logs, cutting and stocking dimension lumber, incising, framing, and transportation of raw materials. There are a limited number of females in the yard crew and quality control laboratory in addition to administrative secretaries.

DESCRIPTION OF PROCESS

Raw logs are purchased or received from McFarland Cascade timber lots for peeling and processing into poles, piling, or dimension lumber. Finished lumber and railroad ties are also received for Treatment Surface Only (TSO) processing either directly from the customer or purchased by Cascade Pole. The raw logs are predominantly Douglas fir with some Western Hemlock, Ponderosa and Lodge Pole Pine and Western Cedar. Limited quantities of hardwoods such as Red Oak are processed for ties, supports, etc. Selected logs are utilized for pilings and utility poles and vary from 30 to 135 feet in length. Most, however, are less than 95 feet long if wood treating is needed. Less suitable timber is used for dimension lumber and a considerable amount comes from the open market or directly from clients.

Lumber, both dimension and poles, receive limited air drying in the yard. Those requiring extensive moisture removal prior to treating, such as CCA, are kiln dried. Boultonizing is done in the creosote and PCP cylinders to remove excess moisture from the wood prior to pressure treatment. Wood treated with ACA is either kiln dried or steam processed prior to pressure treatment

with the warm solution. Creosote and PCP treated wood is air dried prior to shipment. ACA and CCA treated wood is washed down or steamed, followed by air or kiln drying before leaving the yard.

CCA-type C, as a 50% concentrate, is purchased from Kopper's Company in tank truck loads and diluted for use in a 100,000 gallon work tank. Most wood treated by this method is primarily dimension lumber. It is dried, incised and treated for 4-5 hours under pressure at ambient temperature.

ACA is mixed on stie as needed. Copper Oxide (30 gallon drums) is added to arsenic acid in a mix tank. An aqua ammonia solution is then pumped in to complete the reaction. This is done in a small separate building behind the cylinder treatment tank farm. Wood to be treated is either dried or pre-steamed in the cylinder prior to pressure treating. The ACA treated wood is cleaned via a NH_3 bath in the cylinder. A final surface vacuum and wash is applied at the end of the approximately 24 hour cycle to remove excess ammonia and salts prior to opening the cylinder. This process is licensed from the J.H. Baxter Company of California. In addition to treating dimension lumber,

piling is occasionally treated with ACA, dried, and then treated with creosote to inhibit marine piling borers common to southern California and the Gulf of Mexico areas.

PCP-oil treatment is done on incised poles and dimension lumber. Since these are commonly high in moisture content, full length incising is done along with boultonizing prior to the pressure application. In contrast to most other pressure and non-pressure treaters, the PCP treatment solution is 5% in order to minimize oil utilization. The PCP is purchased in 2000# blocks from Reichhold Chemicals, stored in the buildings and dissolved in oil in the cylinder as needed to maintain a stock of working solution for both the cylinder and the butt pole treating tank.

Creosote is supplied by Koppers from California in tank trucks. It is used for dimension lumber treating in addition to pilings and utility poles. Since most of the wood treated by this method is high in moisture and requires boultonizing, the typical cycle time is nearly 24 hours per load. In contrast to some operations observed, this wood leaves the cylinder nearly dry indicating either effective vacuum or post steaming to remove excess creosote.

DESCRIPTION OF PAST EXPOSURES

This plant, which is relatively new, has not had any previous Industrial Hygiene surveys. Safety guidance is provided by the Corporate Safety Director, Rick Overbeck from the Sandpoint, Idaho headquarters. The state of Washington OSHA group has conducted safety inspections in the past but no air sampling was done. EPA data on air and water discharge sources was submitted and the Mitre Corp conducted EPA field work on arsenic at the plant. No insurance carrier reports were available on health risk areas of materials. At the previous plant location 1937 - 1974, FCAP and some fire retardant treating was also done. The plant management does not indicate any health or complaint problems associated with exposure to treatment chemicals except when opening the ACA cylinder door and in the mixing area where ammonia vapor levels can be excessive and irritating. Some Pettibone operators indicate eye and upper respiratory irritation when handling freshly treated PCP, creosote and ACA wood, if wind conditions are unfavorable and flow from the treated bundles toward the cab.

DESCRIPTION OF MEDICAL, INDUSTRIAL HYGIENE AND SAFETY PROGRAMS

The plant currently does not have a formalized medical surveillance program. Some noise-exposed employees, however, receive audiometric exams from a mobile van as frequently as every six months. Pre-employment exams are done but are non-specific for given job descriptions. No other periodic medical tests are done presently.

The pole yard supervisors have frequent meetings with representatives from different operating areas in the yard to discuss safety problems and experience, and conduct investigations. Formal minutes are kept of monthly safety meetings. New employees are trained by their supervisors on safety and protective equipment aspects of their job. They are supervised for at least a month or more before doing certain specifically hazardous tasks alone. There are written procedures for doing some tasks which involve health or safety hazards. The work force is relatively stable and most new employees in the treatment plant are transferred from other areas or operations.

There is a mandatory hard hat policy for the entire yard. Safety glass or face shields are provided and required for specific areas or job tasks such as cylinder door opening, etc. Half-face

dual cartridge respirators are provided for use by the treatment plant operator when mixing ACA, opening cylinder doors, or other non-scheduled tasks where they might be needed. Nuisance dust masks are also available for copper handling, etc. Rubber gloves and coveralls are provided for the operators and are laundered by the company. Scott packs are available for tank cleaning or pressure vessel entry for sludge removal or to dislodge tram cars or lumber.

Nearly all employees use the lunchroom, which has vending machines, tables, lavatory facilities and lockers. It is adjacent to the administration building and away from all process areas. Treatment plant operators typically take their lunch break in the control room since treatment is a continuous process requiring direct supervision and control. Wash-up facilities are also available in the treatment plant and breaks are taken in the control room which is clean but does not have positive pressure ventilation.

INSPECTION OF THE PLANT

An industrial hygiene walk-through survey of the treatment facility was conducted following preliminary discussions with plant personnel. Charles Stoddard and Les Loning provided the basic description of the treatment equipment and process flow. Personal protective gear was examined along with a review of employee work practices and personal hygiene. Air monitoring was conducted when opening the ACA, Creosote, and PCP cylinders. The CCA pressure vessel was not opened during the day of the survey. Wipe samples of ACA and CCA residual salts on dried treated wood were also taken.

Area sampling was done on top of the cylinder door to obtain a maximum estimate of vapors released during this phase of the cycle and collect sufficient material to permit comparison of alternate sampling and analytical methods. No visible emissions occur when opening the CCA cylinder door since it is a water solution at ambient temperature. The other materials, however, produce visible plumes which are most significant near the top of the cylinder face. These are not, however, occupied areas during cylinder unloading and the measurements do not reflect actual employee exposures. Wipe samples were taken from dried ACA and CCA dimension lumber to determine the presence of residual salts and evaluate the possible effects on skin contamination if gloves were not utilized by personnel handling the treated wood.

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. Bendix BDX-41 air sampling pumps, pre- and post-calibrated with a Universal Pump Calibrator, Model 302, were operated at flow rates of approximately 0.75 liters per minute (LPM) for the NIOSH method and 0.65 - 0.70 LPM for the silica gel tube.

The sampling train for the NIOSH procedure included a pre-filter of 0.8 micron Millipore type AA filter, supported by a stainless steel screen in a three-piece cassette, and connected in series with a midget bubbler containing 15 mls. of ethylene glycol. This was followed by a second empty midget bubbler acting 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 a high pressure liquid chromatograph with an ultraviolet detector. The lower limit of PCP detection by this method is 5 micrograms per sample.

PCP collected on large size silica gel tubes (260/520 mg) was desorbed with methylene chloride and analyzed using gas chromatography and a flame ionization detector. The lower limit of detection by this analytical method is 0.01 micrograms PCP per sample.

The NIOSH sampling and analytical method P & CAM 217 was utilized for evaluating airborne levels of creosote. Samples were taken with the Bendix BDX-41 air sampling pumps at air flow rates of 1.2 - 1.7 liters per minute. The sampling train included a glass fiber, Type A prefilter followed by a 0.8 micron silver membrane filter with a cellulose back-up pad in a 37 mm 3-piece closed-face cassette. The samples were analyzed by cyclohexane extraction, evaporation and gravimetric determination of a one-milliliter aliquot of the residue. Duplicate .1 ml aliquots of the extract were also used for ultraviolet analysis at 252 nm on a Beckman DU Spectrophotometer. A bulk sample of creosote was used to prepare a standard calibration curve for the UV method. The limit of detection by the gravimetric method is 5 micrograms and 0.2 microgram for the UV analysis.

The ACA treatment process was evaluated using the NIOSH P & CAM #173 air sampling method for copper and S-309 for arsenic. Arsenic and copper were collected on a 0.8 micron (μ) Millipore AA filter with a cellulose back-up pad in a 37 mm 3-piece closed-

face cassette on an air flow rate of 1.6 - 1.8 liters per minute. The samples were analyzed by Atomic Absorption Spectroscopy. The lower limit of detection for copper was 2.0 microgram and for arsenic, 0.3 microgram. Ammonia was not monitored.

ANALYSIS AND DISCUSSION

The air samples collected for the ACA treatment process did not show any detectable arsenic or copper concentrations. This indicates that there are negligible air emissions of trace metal contaminants during cylinder opening.

The creosote samples indicated measureable quantities of cyclohexane extractable hydrocarbons by both the gravimetric and UV analysis procedures. There was, however, no correlation between the methods. The air concentrations were high, in comparison with OSHA's coal tar pitch volatile limit of 0.2 mg/m^3 but they are not representative of actual employee exposure levels during normal treatment operations.

Pentachlorophenol concentrations monitored during cylinder opening and on the freshly treated wood were below current occupational limits by both sampling/analytical methods. Due to a difference

in analytical sensitivity, the results by the two procedures varied by a factor of at least two. Wipe samples of treated and air dried ACA and CCA poles and posts were taken with 0.8 micron Millipore AA filters. Copper and arsenic were analyzed as previously described. The NIOSH P & CAM #173 method was also used for chromium. The limit of detection for chromium was 0.1 microgram.

RESULTS

The air samples collected during opening of the ACA cylinder (D) and on top of the treated wood in the yard area were below the limits of analytical detection. Based on the sample air volumes, this corresponds to copper levels of less than 90.9 and 2 $\mu g/m^3$ and arsenic concentrations of less than 13.6 and 0.3 $\mu g/m^3$ respectively.

Creosote samples collected at C cylinder door opening and on top of the treated wood in the yard area showed air concentrations of 3.94 and 2.12 mg/m^3 by the gravimetric procedure and 0.66 and 9.71 mg/m^3 by the UV analysis method, respectively. The results by the two analytical methods are significantly different.

Sets of pentachlorophenol air samples were also taken at B cylinder door opening and on top of the treated wood in the yard area. The samples collected by the NIOSH impinger method were all below the limits of analytical detection. Based on the air sample volumes, this corresponds to levels of less than 0.22 and 0.02 mg/m^3, respectively. The silica gel samples showed air concentrations of 0.39 and 0.05 mg/m^3.

The wipe samples taken from the freshly treated CCA and ACA bundles of material showed trace metal levels as follows:

CCA treatment	copper	19 µg
	chromium	37 µg
	arsenic	29 µg
ACA treatment	copper	100 - 240 µg
	arsenic	55 - 150 µg

The analysis of the wipe samples from the freshly treated, air-dried lumber showed that there were some surface salts present. There were greater quantities of trace metals present on the ACA treated wood in comparison with the CCA material. This data suggests only possible skin contamination problems if the freshly treated wood is handled directly without gloves.

Cascade Pole - 5/30/80

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT		CONCENTRATION µg	CONCENTRATION µg/m³
Area sample on top of cylinder after door is opened; unloading & loading cylinder D.	BDX-66 CAS-04	8:24-8:36 12 min.	1.846 lpm 0.022 m³	(ACA) Arsenic		<0.3	<13.6
				Copper		<2.0	<90.9
Area sample on top of wood pile after load came out of cylinder.	BDX-104 CAS-05	8:27-6:10 583 min.	1.580 lpm 0.921 m³	(ACA) Arsenic		<0.3	<0.3
				Copper		<2.0	<2
		Blank		Arsenic		<0.3	
				Copper		<2.0	
Area sample on top of cylinder C at door opening.	BDX-99 CAS-06	8:40-9:08 28 min.	1.690 lpm 0.047 m³	Creosote	grav.	185	3936.2
					UV	31.00	659.6
Area sample on treated wood as it comes out of cylinder - employee holds respirator at face.	BDX-124 CAS-07	8:45-6:05 560 min.	1.233 lpm 0.690 m³	Creosote	grav.	1465	2123.2
					UV	6700	9710