INDUSTRIAL HYGIENE REPORT

COMPREHENSIVE 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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Report written by

Alan S. Todd
Cynthia Y. Timbie

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Industrial Hygiene Section
Industrywide Studies Branch
Division of Surveillance, Hazard Evaluations, and Field Studies
National Institute for Occupational Safety and Health
Cincinnati, Ohio

PURPOSE OF SURVEY:	This comprehensive survey was conducted as a part of the Phase III 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 materials used in wood preservation. This facility was selected on the criteria set forth in the Study Proposal based on information gathered in Phase I & II.
EMPLOYER REPRESENTATIVES CONTACTED:	Charles Stoddard, Vice President and Technical Director, McFarland Cascade Co., Sandpoint, Idaho (208) 263-2141. Les Lonning, Manager, Quality Control Cascade McFarland, Tacoma, Washington (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 comprehensive survey of the Cascade Pole Company, Tacoma, Washington wood treatment plant was done as a partial fullfillment of obligations to the National Institute for Occupational Safety and Health under Contract No. 210-78-0060, "Industrial Hygiene Assessment of New Agents - III". The field site survey was conducted on July 23-25, 1980 to quantify exposures and evaluate potential health risk under typical operating conditions. Personal breathing zone sampling was done to define exposures during specific tasks or by job category. Supplemental area sampling was also done when appropriate to determine downwind air concentrations where other employees were working. Work practices, and engineering methods which might affect occupational exposure were investigated.

Personal and area sampling indicates that all exposures except one were well within the current occupational limits for creosote (CTPV), pentachlorophenol, copper, chrome, and arsenic. One sample had excessive arsenic but its reliability is questionable since the other components of the CCA mixture- copper and chromate, were below the limits of analytical detection. Copper, chrome, and arsenic analysis of wipe samples for ACA or CCA treated wood showed some surface salts present. These data suggest possible skin contamination problems if the freshly treated wood is handled directly without gloves. Work practices and other aspects affecting potential exposure by these routes are discussed.

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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 comprehensive industrial hygiene survey at the Cascade Pole Company, Tacoma, Washington on July 23-25, 1980. The plant processes and treats fence parts, guard rails, 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 comprehensive survey was to document and evaluate employee exposures and factors affecting them as a function of process methods, materials used, work practices, and controls.

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 office which total 14 on 46 acres. A majority of the property is utilized for the processing of logs and untreated lumber and finished product storage. The primary products of the treating plant are dimension lumber for guard rails, posts, 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. A majority but not all the processed wood is then treated before shipment.

In the wood treating area, there are two adjacent process buildings used for a control room; storage of chemicals and equipment; and preparation and blending of ACA treating solution. Chemical storage and mix tanks for all four treatment systems are adjacent to the process building and pressure cylinders. All four cylinders are 8 feet in diameter and outdoors in entirety. Cylinder A, nearest the control room, is 40 feet in length and is used exclusively for CCA (Kopper's licencee). B cylinder 95 feet in length is used for PCP (5%) in P-9 type A oil. The Creosote cylinder (C) is also 95 feet in length. The last cylinder (D) is 105 feet long and is used only for ACA treatment.

Cylinder D has a hydraulically operated door, the remaining three currently are manually sealed and opened with an air wrench. The tram cars with 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 presently 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 at a time. It is loaded when horizontal with Pettibone vehicles.

DESCRIPTION OF WORKFORCE

The plant currently has 115 employees, a majority of which are not in the wood treating areas. The hourly employees are represented by the International Union of Operating Engineers. The plant has 96 personnel in the production areas, 15 in administration, and 4 supervisors in the wood processing areas. The employees, for the most part, work a single 8 hour shift, 5 days per week. The treatment facility, however, 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 some 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 stacking 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 TSO processing (Treatment Surface Only) 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, with mixtures such as CCA, are kiln dried. Boultonizing or stem pretreatment is done in the creosote and PCP cylinders to remove excess moisture from the wood prior to pressure penetration. 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 air dried or kiln dried before leaving the yard.

CA-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. 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 batch mixed on site as needed. Copper Oxide received in (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 at the rear of the cylinder treatment tank farm. Wood to be treated is either dried or pre-steamed in the cylinder prior to pressure treating. A final vacuum and surface wash is applied at the end of the approximately 23 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.

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.

The PCP is purchased in 2000# blocks from Reichhold Chemicals, stored in the treatment building 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 structural timber treating in addition to marine pilings and utility poles. Since most of the wood treated by this method is high in moisture which 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 more effective vacuum removal or post steaming to remove excess treating solution.

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 per se was done. EPA data on air and water discharge sources was submitted and the Mitre Corp conducted field work for EPA on arsenicals used at the plant. No insurance carrier reports were available on health risk acessment on 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 temporarily 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 and experience problems, 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 performing 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 operators when mixing ACA, opening cylinder doors, or other non-scheduled tasks such as leaks where they might be needed. Nuisance dust masks are also available for copper oxide drum dumping, etc. Rubber and other gloves and coveralls are provided for the operators and are laundered by the company.

Scott packs are available for tank cleaning, 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, however, 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

A preliminary industrial hygiene survey of this treatment facility was conducted May 30, 1980. Charles Stoddard and Les Lonning provided the basic description of the treatment equipment and process at that time. During the present comprehensive study, Les Lonning answered supplimentary queries on process details and operating practices.

Personal air sampling was done during cylinder door opening; removal of treated wood; unloading of tram cars; and the restacking and banding of the treated materials. Treatment operators as well as yard laborers were monitored for their exposures to the preservative chemicals during these critical tasks.

Area sampling was also done at downwind locations where other employees were working, i.e., framing area and control room. An area sample was also taken in the PCP block storage area to determine if airborne PCP, resulting from the sublimation of the solid material, could be detected.

Wipe/touch samples were taken on ACA treated wood while wet and when semi-dry and on CCA treated material before and after flushing with water. This was done for the purpose of determining the presence of residual salts and evaluating the possible effects on skin contamination and or absorption if gloves were not utilized by personnel handling the wet treated wood.

MONITORING PROCEDURES

Integrated breathing zone and area sampling was done using Bendix BDX-41 air sampling pumps pre-and post calibrated with a Universal Pump Calibrator, Model 302, and the appropriate collection device.

PCP was collected at 0.5 to 0.7 liters per minute on large size silica gel tubes (260/520 mg) according to the Dow Chemical procedure. Samples were desorbed with methylene chloride derivatized and analyzed using gas chromatography with a flame ionization detector. The lower limit of detection by this analytical method is 0.002 micrograms of PCP per sample.

The NIOSH sampling and analytical method P & CAM 217 was utilized for evaluating airborne levels of creosote. Samples were taken at air flow rates of 1.7-2.1 liters per minute. The sampling train included 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 lower limit of detection by the gravimetric procedure is 5 micrograms and 0.2 microgram for the follow up UV analysis method.

The ACA and CCA treatment processes were evaluated using the NIOSH P & CAM #173 air sampling method for copper and chromium and S-309 for arsenic. The samples were collected on a 0.8 micron (u) Millipore AA filters with a cellulose back-up pad in a 37 mm 3-piece closed-face cassettes at an air flow rate of 1.8-2.0 liters per minute. The samples were analyzed by Atomic Absorption (AA) Spectroscopy. The lower limit of detection for copper was 2.0 microgram; chromium, 1.0 microgram; and arsenic, 0.3 microgram. Ammonia from the ACA process was evaluated by grab sampling with short-term Draeger dector tubes. Wipe/touch samples from the ACA and CCA treated wood were collected with Whatman filter papers and trace metals were analyzed as described above by AA.

DATA REVIEW

Personal breathing zone samples were taken on treatment operators and yard laborers handling the freshly treated materials over a three-day, three-shift period. Airborne exposures to pentachlorophenol, creosote, chromium, arsenic, copper, and ammonia were evaluated for the duration of critical tasks. The detailed monitoring is appended but summarized for review as follows:

Creosote [1] Treatment

	GRAV. (ug/m^3)	UV (ug/m^3)
yard laborer unloading tram cars of treated material (280 min.)	159.0	8.4
yard laborer unloading tram cars of treated material (230 min.)	< 12.9	< 0.5
treatment operator, opening cylinder and discharging (66 min.)	1343.3	111.9
treatment helper, assisting cylinder opening and discharge (55 min.)	< 49.0	83.3
yard laborer, unloading tram cars of treated material (250 min.)	< 9.7	< 0.4
yard laborer unloading tram cars of treated material (247 min.)	< 9.6	< 0.4

Pentachlorophenol[2] Treatment

	ug/m^3
treatment helper, assisting cylinder opening & discharging (20 min.)	74.9
treatment operator, cylinder opening & discharging (20 min.)	132.9
yard laborer, unloading tram cars of treated material (207 min.)	5.1

[1] CTPV exposure limit currently applied to creosote is 200 $\mu g/m^3$.

[2] Current Occupational Exposure Limit is 500 $\mu g/m^3$

	ug/m^3
yard laborer, unloading tram cars of treated material (207 min.)	14.5
treatment helper, assisting cylinder opening & discharging (19 min).	71.3
treatment operator, cylinder opening and discharging (23 min.)	15.1

CCA[3] Treatment

	copper	chromium (ug/m^3)	arsenic
treatment helper, cylinder opening & discharging (18 min.)	<55.6	<27.8	<8.3
treatment operator, cylinder opening and discharging (18 min.)	<62.5	<31.2	<9.4
treatment operator, cylinder opening and discharging (72 min.) Series of 4 cylinder openings.	<13.6	<6.8	3265.3
treatment helper cylinder opening and discharging (80 min.). Series of 3 cylinder openings.	69.2	6.3	4.5

ACA[4] Treatment

	arsenic	copper (ug/m^3)
treatment operator, cylinder opening and discharging (29 min.)	<5.2	<34.5
treatment helper, cylinder opening and discharging (27 min.)	<5.8	<38.5
treatment operator, cylinder opening and discharging (25 min.)	<6.0	<40.0
treatment helper, cylinder opening and discharging (26 min.)	<6.0	<40.0

[3]Current Occupational exposure limits: copper mist/dust 1000 µg/m^3, chromic acid 100 µg/m^3, arsenic 500 µg/m^3.

[4]Current occupational exposure limits: copper mist 1000 µg/m^3, arsenic 500 µg/m^3.

The air monitoring showed creosote exposures by the (U.V. method) varying from <0.4 ug/m^3 to 111.9 ug/m^3. The higher concentrations occurred on the treatment plant personnel during cylinder opening. These levels are low in comparison with OSHA's current coal tar pitch volatile limit of 0.2 mg/m^3. There was no correlation between the gravimetric and UV analytical methods data as anticipated.

Pentachlorophenol levels ranged from 5.1 to 132.9 ug/m^3. Again the higher exposures occurred on the treatment plant personnel during cylinder opening. The permissible exposure limit for PCP is 500 ug/m^3 and all personal exposures were 27% or less of this standard.

Treatment plant personnel exposures to airborne trace metals during cylinder opening for the ACA and CCA process were below the limits of analytical detection in all samples but two. One sample was taken on the treatment operator during a series of four CCA cylinder openings. No chromium or copper was detected but the arsenic level was exceptionally high. This can not be adequatedly explained because with the high level of arsenic, some copper or chromium would have also been expected. The other sample was taken on the treatment helper during a series of three cylinder openings. No chromium was present but there were low levels of arsenic and copper, i.e., less than 1% and 7% of the respective standards.

Area sampling was done at locations downwind of the treatment area to document potential exposures to other yard or supervisory personnel working or passing through these areas. The results are summarized as follows:

	Creosote (ug/m^3)	
	grav.	U.V.
area sample at window inside treatment control room. (356 min.)	< 6.8	< 0.3
area sample at window inside treatment control room (258 min.)	162.7	< 0.4
	Pentachlorophenol (ug/m^3)	
area sample at framing operation adjacent the treatment plant (197 min.)	1.2	

Area airborne creosote levels using the UV method were below the limits of detection, i.e., less than 0.4 ug/m^3. Again the gravimetric and U.V. data showed no correlation. Pentachlorophenol was detected at the framing operation but concentrations were very low - < 1% of the OSHA limit. The odor of each of these components was detected in the respective areas during the sampling periods.

An area sample taken in the PCP block storage area in a separate room of the treatment building showed an airborne concentration of 11.4 ug/m^3. This level (2% of permissible limit) is not significant in terms of employee exposures since no one is typically working in this room. However, it does indicate that sublimation (vaporization of a solid), and therefore, a limited amount of material loss is occurring.

Grab samples were taken for ammonia during ACA cylinder door opening. The airborne level at the door where the employee was wearing a dual cartridge respirator approved for ammonia fumes and, therefore, should not have had any measureable exposure. Another sample taken two feet downwind of the treated material after it was removed from the cylinder also showed 250 ppm. No one was, however, working at that location. The yard crew responsible for unloading the tram cars may occassionally be exposed to high levels of ammonia for short periods of time depending on the time interval between discharge and unloading. These employees, however, routinely take advantage of wind direction to minimize their exposures.

The wipe/touch samples from CCA and ACA treated bundles of material showed trace metal levels as follows:

		micrograms		
	freshly treated		semi-dry	
ACA treatment	arsenic	53 15	0.94	0.76 64
	copper	38 9.8	3.3	3.4 110
	rinsed dry		rinsed wet	
CCA treatment	arsenic	41	7.1	64 280
	copper	13	5.9	55 290
	chromium	65	21	65 300

The analyses indicate that there are some surface salts present. The difference in the metal concentrations for the CCA treated and rinsed materials can probably be attributed to the extent of rinsing that was done.

The results for the ACA treatment are, in general, similar for the freshly treated and semi-dry material. This data suggests only possible skin contamination problems if the freshly treated wood is handled directly without gloves.

ANALYSIS AND DISCUSSION

The personal and area monitoring results indicate that employee exposures to all the treatment chemicals are well within current OSHA and ACGIH (TLV) limits. The short-term exposures evaluated during critical tasks such as cylinder opening were higher as anticipated but again, well within recommended limits. Ammonia grab sampling showed high short-term peak concentrations but the affected employees were wearing respiratory protection. It is suggested that the laborers responsible for unloading the treated materials could also occassionally have some high short-term peak exposures to ammonia. Personnel observed during the various tasks generally are able to take some advantage of wind direction to help minimize exposures. The treatment operators utilize respiratory protection when this is not feasible. Two hydraulically operated cylinder doors are on site to replace two of the remaining 3 manually operated ones. These when installed will help reduce both exposure time and proximity during door openings when airborn contaminants are at maximum concentration.

The treatment operators wear coveralls, gloves, and hardhats during all of their tasks. The yard laborers have hardhats, gloves, and the typical work clothing. Since these personnel

have a greater potential for skin and/or clothing contamination during the unloading of the tram cars and soiled clothing was observed, it is recommended that they also be provided coveralls which they should be required to be left in their locker at the end of the day before leaving the yard. The frequency of change will be determined by visual inspection for contamination.

Appendix A
Air Monitoring
Results

Cascade Pole Company 1

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m³
Area sample at window, inside treatment - control room. A load of warm treated material is out in the yard being unloaded, odor is evident in this area.	BDX-66 CAS-104	11:05 - 5:01 356 min.	2.058 LPM 0.733 m^3	Creosote-grav. UV	< 5 < 0.2	< 6.8 < 0.3
BZ-Kurt Anderson laborer-unloading treated material from tram car and restacking; wearing gloves, clothes soiled. (still warm, some fumes visible).	BDX-61 CAS-102	11:10-3:50 280 min.	2.020 LPM 0.566 m^3	Creosote-grav. UV	90 4.75	159.0 8.4
BZ-Manuel Burgas laborer-unloading treated material from tram cars and restacking 6" x 6" RR timbers and industrial sets both laborers are working together. (still warm, some fumes visible) more potential skin contact from tram car and bands, rather than wood.	BDX-143 CAS-103	11:12-3:50 230 min.	1.688 LPM 0.388 m^3	Creosote-grav. UV	< 5 < 0.2	< 12.9 < 0.5
BZ-Floyd Rudolph unbolting C cylinder creosote treatment. Wears gloves, (treatment operating engineer.) wearing dual cartridge respirators when discharging cylinder.	BDX-104 CAS-100	2:36-3:42 66 min.	2.027 LPM 0.134 m^3	Creosote-grav. UV	180 15.0	1343.3 111.9

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m³
BZ-Steve Rowe operator - helper will be treating pilings (Mocca pretreat) - wears dual cartridge respirator.	BDX-58 CAS-101	2:47-3:42 55 min.	1.861 LPM 0.102 m^3	Creosote-grav.	< 5.0	< 49.0
				UV	8.5	83.3
Area sample at window inside control room load of hot creosote-treated material in holding area - load taken out of cylinder at 3:30	BDX-154 CAS-105	5:05-9:23 258 min.	2.142 LPM 0.553 m^3	Creosote-grav.	90	162.7
				UV	< 0.2	< 0.4
BZ-James Paine treater helper emptying CCA cylinder	BDX-104 CAS-106	18:12-18:30 18 min.	1.990 LPM 0.036 m^3	Copper	< 2.0	< 55.6
				Chrome	< 1.0	< 27.8
				Arsenic	< 0.3	< 8.3
BZ-Davick, Gary treating engineer emptying CCA cylinder	BDX-58 CAS-107	18:12-18:30 18 min.	1.794 LPM 0.032 m^3	Copper	< 2.0	< 62.5
				Chrome	< 1.0	< 31.2
				Arsenic	< 0.3	< 9.4
1st shift 7-24-80 BZ sample Larry Weeks treater helper during cylinder opening	BDX-95 CAS-108	2:00-2:20 20 min.	0.763 LPM 0.015 m^3	PCP	1.124	74.9

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m³
Treater operator BZ-Guy Zillyette during cylinder opening	BDX-106 CAS-109	2:00-2:20 20 min.	0.718 LPM 0.014 m^3	PCP	1.861	132.9
BZ-Manuel Burgas laborer unloading PCP charge - strapping stacks of treated material	BDX-93 CAS-110	8:18-11:45 207 min.	0.618 LPM 0.128 m^3	PCP	0.648	5.1
both wearing gloves, switched to unloading creosote treated material (fully incised dimension lumber)	BDX-66 CAS-115	11:45-3:55 250 min.	2.058 LPM 0.514 m^3	Creosote-grav.	< 5.0	< 9.7
				UV	< 0.2	< 0.4
BZ-Kurt Anderson laborer unloading PCP charge, assisting Pettibone operator unload tram cars	BDX-33 CAS-111	8:21-11:48 207 min.	0.557 LPM 0.115 m^3	PCP	1.672	14.5
and restack treated material both wearing gloves - switched to unloading creosote treated material	BDX-128 CAS-116	11:48-3:55 247 min.	2.106 LPM 0.520 m^3	Creosote-grav.	< 5.0	< 9.6
				UV	< 0.2	< 0.4
Area sample down - wind of PCP treated charge - framing operation occurring in adj. area.	BDX-95 CAS-112	10:11-1:28 197 min.	0.763 LPM 0.150 m^3	PCP	0.178	1.2

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m³
BZ-Steve Rowe unloading ACA cylinder - operator's helper - wears full face canister laborers assisted unloading of cylinder	BDX-66 CAS-113	10:58-11:25 27 min.	1.941 LPM 0.052 m^3	Arsenic Copper	< 0.3 < 2.0	< 5.8 <38.5
BZ-Floyd Rudolph unloading ACA cylinders - operator ACA tank has hydraulic door. wearing dual cartridge resp.	BDX-128 CAS-114	10:57-11:26 29 min.	2.002 LPM 0.058 m^3	Arsenic Copper	< 0.3 < 2.0	< 5.2 <34.5
BZ-Floyd Rudolph operator engineer opening 4 cylinder CCA tank - helper is not needed for this opening - wears gloves.	BDX-154 CAS-117	1:30-1:45 15 min.	2.049 LPM	results indicated on next page, sample collected during series of cylinder openings.		
Area sample in PCP storage area. In enclosed area adj. the treatment bldg. 4-5 from PCP blocks.	BDX-95 CAS-119	8:08-11:05 177 min.	0.763 LPM 0.135 m^3	PCP	1.540	11.4

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m³
BZ-treatment plt. helper-when opening CCA cylinders. (A)	BDX-104 CAS-118	19:45-20:15 2:10- 2:20 8:18- 8:58 80 min.	1.990 LPM 0.159 m^3	Copper	11	69.2
				Chrome	<1.0	<6.3
				Arsenic	0.72	4.5
BZ-treatment oper. when opening CCA cylinders (A)	BDX-154 CAS-117	19:49-19:57 2:10- 2:20 8:16- 8:55 72 min.	2.049 LPM 0.147 m^3	Copper	<2.0	<13.6
				Chrome	<1.0	< 6.8
				Arsenic	480	3265.3
BZ-Floyd Rudolph treatment oper. opening B cylinder - wears dual cartridge organic vapor resp. treating poles	BDX-106 CAS-120	9:22-9:45 23 min.	0.718 LPM 0.016 m^3	PCP	0.241	15.1
BZ-Steve Rowe treatment helper - opening B cylinder - wears dual cartridge organic vapor resp.	BDX-130 CAS-121	9:22-9:41 19 min.	0.628 LPM 0.012 m^3	PCP	0.856	71.3
BZ-Floyd Rudolph operator engineer opening ACA cylinder D	BDX-128 CAS-122	10:30-10:55 25 min.	2.002 LPM 0.050 m^3	Copper	2.0 <	40.0
				Arsenic	0.3 <	6.0
BZ-Steve Rowe treatment helper opening ACA cylinder D	BDX-66 CAS-123	10:30-10:56 26 min.	1.941 LPM 0.050 m^3	Copper	< 2.0 <	40.0
				Arsenic	< 0.3 <	6.0

SAMPLE DESCRIPTION	PUMP# SAMPLE#	SAMPLING TIME (min)	FLOW RATE TOTAL AIR VOLUME	COMPONENT	CONCENTRATION µg	CONCENTRATION µg/m3
7/25/80	CAS-124 Blank Silica gel tube		front	<0.002 µg		
			back	<0.002 µg		
7/24/80	CAS-127 Blank Creosote - silver membrane		grav.	<5.0		
			uv.	<0.2		
7/25/80	CAS-128 Blank AA filter for ACA analysis		As	< .3 µg		
			Cu	< 2 µg		
7/25/80	CAS-129 Blank AA filter for CCA analysis		As	<0.3		
			Cr	<1.0		
			Copper	<2.0		
7/24/80	Grab samples taken at cylinder door opening (4CA) where employee was standing.			ammonia	250 ppm	
7/24/80	Grab sample taken after treated material had been removed from cylinder, 2 feet downwind.			ammonia	250 ppm	