U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 75-117-372

KOPPERS COMPANY, INCORPORATED
NORTH LITTLE ROCK, ARKANSAS

MARCH 1977

I. TOXICITY DETERMINATION

It has been determined that employees performing duties in the wood treating operation at Koppers Company, Incorporated, North Little Rock, Arkansas, were exposed to potentially toxic concentrations of particulate polycyclic organic matter (PPOM) as cyclohexane solubles, which includes polynuclear aromatic hydrocarbons. Exposure(s) of employees to airborne concentrations of pentachlorophenol (PCP) were not found to be toxic at the levels encountered and under the conditions observed.

Medical interviews conducted and limited physical examinations performed on eleven (11) persons employed in the wood treating area failed to produce evidence which would indicate medical problems resulting from the use of PCP. Nine of the eleven workers who were interviewed and examined reported at least one previous episode of eye burning, redness or tearing, which they attributed to creosote "fumes". Some exposed workers had oil folliculitis and "pitch" warts, probably from exposure to creosote.

The current creosote treatment (70% creosote and 30% coal tar solution) of railroad ties had been used at the plant for less than a year. Medical problems associated with long-term exposure to coal tar pitch volatiles (CTPV) usually require a number of years to develop.

These determinations are based on data collected during a medical survey conducted on July 28-29, 1975, an environmental survey conducted on February 24-25, 1976, and a review of available literature.

Various recommendations were made to management at the time of the study for possible improvement of existing conditions in the treating area work environment and are presented herein. Recommendations were similarly made for an occupational medical program.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati, Ohio address. Copies have been sent to:

a) Koppers Company, Incorporated, North Little Rock, Arkansas
b) Authorized Representative of Employees - International Woodworkers of America, Local #5-298.
c) U. S. Department of Labor, Region VI
d) NIOSH - Region VI

For the purpose of informing the approximately eighteen (18) "affected employees", the employer shall promptly "post" the Determination Report in a prominent place(s) near where exposed employees work, for a period of thirty (30) calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6), authorized the Secretary of Health, Education, and Welfare, following receipt of a written request from an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees (International Woodworkers of America) regarding their concern of the exposure of workers in the wood treating area to creosote and PCP.

IV. HEALTH HAZARD EVALUATION

A. Description of Process - Conditions of Use

This plant, commencing operations as Koppers Company, Incorporated in 1932, currently employs a total of approximately 142 persons--thirty-two (32) in administrative or supervisory categories; eight (8) in maintenance operations; and the remaining 102 in production. Of these numbers, some eighteen (18) persons are involved in the actual wood-treating of railroad ties and telephone poles, utilizes both creosote and PCP. The six (6) cylinders used in the process are 120 feet in length, six (6) feet in diameter, and are essentially identical in design.

Cylinder loading is accomplished by the insertion of specially designed railway cars containing the lumber to be treated. Each cylinder is closed with a hinged circular door which is manually bolted and unbolted with impact wrenches. Five (5) cylinders are utilized for creosote and one (1) for PCP treatments. Individual treatment times vary with the type chemical and product being treated, and range from seven (7) to twenty-four (24) hours. The creosote treatment, as employed for the past six months, utilizes a solution of 70 percent creosote and 30 percent coal tar solution.

With a single important exception, chemical handling, mixing and dispensing operations are automatically metered and enclosed--thus minimizing employee exposure. The unbolting and opening of cylinders appears to present minimal exposure since, (a) the cylinders are steam purged after the treating process is completed, and (b) the exposure time is quite brief.

The previously-mentioned exception involves the use of the supply of PCP, which is generated from a hand-mix operation occurring approximately twice each month. Some 200-250 fifty (50) pound bags of PCP are manually opened and mixed with heated fuel oil in an existing hopper. The operation consumes 3-4 hours for one employee each time the mixing occurs. A simple exhaust fan is used to remove fumes, etc., generated from the mixing operation. Appropriate respiratory protective equipment is worn by those persons required to perform duties in this area.

B. Evaluation Design

1. On July 28-29, 1975, an initial walk-through survey was conducted of the facility by NIOSH representatives, Mr. H. L. Markel, Jr., James B. Lucas, M.D., and Robert N. Ligo, M.D., who were accompanied by representatives of both management and the International Woodworkers of America, Local #5-298. No environmental sampling was conducted at that time; considerable information was, however, gathered on the characterization of substances and conditions of their use. Areas where possible significant exposure to PCP and creosote might occur were identified.

   A total of eighteen (18) workers frequented these areas, eleven (11) of which were available for interview and examination. This group consisted of three treating operators, three assistant treating operators, two doormen, one oil unloader and two laborers, ranging in age from 24 to 61 years with a mean of 41 years. Their length of employment at this plant ranged from four (4) months to thirty-six years with a mean employment of 10.1 years.

   Workers were privately interviewed in a non-directed manner by the NIOSH medical officers concerning any health problems which the workers felt were related to their specific jobs at the plant. A questionnaire was administered to elicit symptoms which might be anticipated from exposure(s) to PCP and creosote. A limited exam was also performed, which included examination of the skin and vital signs as well as blood pressure determination. Workers were informed of abnormal findings at the time of their examinations. In addition, urine specimens were collected for pentachlorophenol analyses--four (4) of which were split and a portion given to the Koppers Company, Incorporated for similar analyses. Control urine specimens were obtained from four (4) NIOSH employees who had no known previous exposure to PCP.

2. Follow-up Environmental Survey

   In order to more fully evaluate employee exposure to chemicals mentioned in the earlier portion of this report, it was deemed appropriate and necessary to collect air samples in the treating area and submit them to the laboratory for appropriate analyses. This follow-up environmental survey was conducted on February 24-25, 1976. No further medical evaluation was made at that time.

C. Evaluation Methods

1. Pentachlorophenol (PCP)

Personal breathing-zone and area samples were collected by using MSA, Model G battery-operated vacuum pumps with HA 0.45μ pore density filters at sampling rates of 1.7 liters per minute. In order to determine whether any of the PCP was passing through the filter, midget impingers containing 15 milliliters of 0.1N sodium hydroxide were inserted into the sampling train on some of the samples collected during the survey. Samples were analyzed by gas chromatography with electron capture at a limit of detection of 0.02μg/sample.

2. Alpha (α) and Beta (β) Naphthylamine

Personal breathing zone samples were collected with silica gel tubes in line with low-flow SIPIN, Model SP-1 personal sampler pumps at a rate of approximately 0.050 liters per minute. Samples were analyzed by gas chromatography at a lower detection limit of 1 μg/tube.

3. Particulate Polycyclic Organic Matter (PPOM) Total Polynuclear Aromatics (PNA), and Benzo-a-Pyrene (BaP).

Personal breathing-zone samples were collected by using MSA, Model G, battery-operated vacuum pumps with three-piece cassettes containing a glass fiber filter followed by a silver membrane filter and backup pad at a flow rate of 1.7 liters per minute. Also included in the sampling train were silica gel tubes.

Samples were analyzed for PPOM by using ultrasonic extraction (Sawicke's method)[1] and gravimetric (Cahn Electrobalance) techniques.

PNA levels were analyzed by a new method[2] developed by NIOSH laboratories which has proven to be more specific for the higher molecular weight polynuclear aromatics, and under which only the minimum and maximum amounts or the range of, PNA is reported.

Analyses were made for benzo-a-pyrene utilizing gas chromatography with flame ionization detection.

D. Evaluation Criteria

1. Environmental Standards or Criteria

The evaluation standards and criteria considered to be applicable to this evaluation are as follows:

The Occupational Health Standards as promulgated by the U.S. Department of Labor, Federal Register, May 28, 1975, Title 29, Chapter XVII, Subpart G, Tables Z-1 and Z-2 (29 CFR Part 1910.1000),

American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) for Chemical Substances and Physical Agents in its Workroom Environment for 1975, and

NIOSH Criteria Documents recommending occupational standards.

(Note: A Federal Occupational Health Standard exists for coal tar pitch volatiles -- namely, 0.2 mg/M^3.)

The recommended TLV's as promulgated by the ACGIH, and applicable to the principal individual substances used in this evaluation are as follows:

Substance	8-hr time-weighted average concentration ACGIH, TLV Committee (mg/M^3)*	Comparable OSHA Standard (mg/M^3)*
Pentachlorophenol (PCP)	0.5	0.5
Coal tar pitch volatiles	0.2	0.2
Particulate polycyclic organic matter (PPOM as benzene solubles)	0.2	0.2
**Alpha (α) or Beta (β) Naphthylamine	--	--
***Benzo-a-pyrene-skin (BaP)	--	--
****Polynuclear aromatic hydrocarbons (PNA)	--	--

*mg/M^3 = milligrams of substance per cubic of air sampled.

**There is no ACGIH recommended TLV for alpha or beta naphthylamine although both compounds are considered as carcinogens by the Occupational Safety and Health Administration (OSHA). In this regard, OSHA has strict standards 29CFR 1910.1000 for the protection of workers involved in the manufacture, processing, release, handling or storage of any substance containing more than one-tenth of one percent of beta naphthylamine or more than one percent of alpha naphthylamine.

***There is no ACGIH recommended TLV for BaP. However, it is a known carcinogen and the Standard Advisory Committee on Coke Oven Emissions (Federal Register, July 31, 1975, 29CFR 1910.1029) has recommended that employees not be exposed to concentrations of BaP in excess of 0.0002 mg/M^3, based on an eight-hour time-weighted average.

****There are no ACGIH recommended TLV, Federal Occupational Health Standards, or other health guides concerning PNA.

Occupational health exposure limits for individual substances have been generally established at levels designed to protect workers occupationally exposed on an eight-hour per day, forty (40) hour

per week basis over a normal working lifetime.

2. Medical

a. PCP

PCP is widely used molluscicide, herbicide, insecticide, and microbiocide. To enhance preservation, it has been extensively applied to wood and other cellulose products, adhesives, leather, oils, paints latex and rubber. It is especially important in the control of termites and other wood-boring insects.

PCP is a highly toxic substance and is readily absorbed through the skin, especially from aqueous solution or when dissolved in oils or organic solvents. In addition to irritative dermatitis, numerous fatalities have been recorded resulting from skin contact. Low concentrations of the dust produce painful irritation to the mucous membranes of the nose, throat, and eyes and these warning symptoms usually are sufficient to prevent serious systemic effects. Prominent symptoms of systemic intoxication include respiratory distress, hyperpyrexia, marked sweating, and rapidly progressive coma. These effects follow acute exposures and chronic poisoning probably does not occur.

As PCP is not a "natural" component of the earth's crust, its environmental or biologic presence is thought to represent contamination from manufacture and human usage. Current analytic methods permit its detection reliably to levels as low as 3-10 parts per billion.

PCP is prepared by the chlorination of phenol and its commercial production is commonly accompanied by the formation of various side products. These include tetrachlorophenol, trichlorophenol, chlorinated diphenyl ethers, chlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins (chlorinated dioxins). Many of these substances are present as impurities in commercial grade PCP and the chlorinated dioxins are of particular importance in this study. This highly toxic group of compounds also occur as contaminants in the production of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), a widely used herbicide. Since they are extremely stable chemically, their accumulation in the environment has been extensively studied in the past several years and has generated much concern.

2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD) and the other chlorinated dioxins are among the most toxic substances yet discovered, and lethal effects in some species have been demonstrated in the parts per trillion dose range. Males of all species

appear to be more susceptible than females. TCDD is teratogenic in some animal species. Other effects of sublethal concentrations include thymic atrophy, hepatic lesions and cardiac lesions. Hematologic changes have been reported. It is also an extremely potent inducer of the hepatic enzyme delta-amino levulinic acid synthetase. In man, chloracne and porphyria cutanea tarda have been reported among workers exposed to 2,4,5-T contaminated with TCDD and it is generally considered the most potent chloracnegenic compound known.

Chloracne is an extremely refractory form of occupational acne produced by exposure to a variety of chlorinated aromatic compounds, and is often accompanied by serious systemic toxicity. Compounds known to cause chloracne include chloronaphthalenes, polychlorobiphenyls, polychlorinated dibenzofurans, chlorobenzenes, dichlorobenzonitrile, and polychlorinated dibenzo-p-dioxin. It is of interest that pure PCP is not acnegenic. The clinical features of chloracne consist of cysts, comedones, (black-heads), pustules, and abscesses which heal with eventual scarring. Comedones resulting from follucular hyperkeratosis may predominate and may involve nearly every hair follicule.

The preferential sites of involvement are the exposed areas of the body, characteristically the temples, upper cheeks, ears, and temporozygomatic areas. In more severe cases, other body areas become involved. Once established, the condition tends to persist many years and is ordinarily refractory to the usual therapeutic modalities. Among the systemic effects reported to accompany chloracne are hepatoxicity, myocardial degeneration, toxic nephritis, hypertension, peripheral edema, and weight loss. A wide range of neurologic symptoms have also been reported, including peripheral neuropathy, headaches, coordination disturbances, fatigue, loss of libido, and emotional instability. Hyperlipidemia, especially of the triglyceride fraction, has been reported. It is interesting to note that in some chloracne outbreaks the incidence of systemic effects is as high as 50%. while in other instances (presumably due to the same chloracnegen-TCDD) there has been little evidence of systemic toxicity.

Porphyria cutanea tarda (PCT) results from the excessive hepatic synthesis and storage of porphyrins which are hemoglobin precursors. Clinically, common findings include polycythemia, skin fragility, blistering in sun exposed areas, hirsutism, and hyperpigmentation. PCP is not necessarily associated with chloracne, and is also caused by a variety of other chemical substances which are not known to cause chloracne.

b. Creosote

Creosote is a complex mixture of multiple aromatic compounds obtained from the distructive distillation of wood or coal. Because of its relatively low cost and microbiocidal properties, it has found wide application in wood preservation.

Skin contact or exposure to the vapors results in intense burning and itching. Since several phototoxic substances are usually present in commercial grades of creosote, the exposed skin displays a markedly enhanced sunburn response with sufficient ultraviolet stimulation. Eventually, hyperpigmentation of exposed skin areas results. Animal studies have also demonstrated that creosote is an active skin carcinogen, but its role in human cancer is still to be proven. While skin absorption occurs, serious systemic effects, including cardiovascular collapse and death, have been observed only after ingestion. Once widely used in medicine, occasional instances of "self-medication" are still reported and sometimes lead to chronic intoxication characterized by visual disturbances, hypertension and gastrointestional bleeding.

c. Coal Tar Pitch Volatiles

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing cancer of the lung, skin, bladder and kidney. Repeated exposure to these materials may also cause sunlight to have a more severe effect on the skin. Allergic skin rashes are also known to result from this type of exposure.

E. Evaluation Results and Discussion

1. Environmental

The results of forty-three (43) air samples, resulting in seventy-six (76) analyses--9 Pentachlorophenol; 11-Particulate polycyclic organic matter; 11-Total polynuclear aromatic hydrocarbons; 11-Alpha naphthylamine; 11-Beta naphthylamine; and 23 Benzo (a) pyrene, collected during the February 24-25, 1976 survey, are shown in Tables 1 through 4.

As can be seen from Table 1, concentrations of PCP are below recommended levels and/or existing standard(s). Table 2 shows that levels of PPOM detected varied from 0.07 mg/M^3 to a maximum of 0.55 mg/M^3. Eight (8) of the eleven (11) samples collected exceeded The Department of Labor (DOL) standard of 0.2 mg/M^3. Although there is no recommended ACGIH TLV or applicable DOL standard, sample results <u>do</u> indicate employee exposure to PNA.

Table 3 indicates that no BaP was detected in the twenty-three (23) air samples collected during the survey. Improved sensitivity for the analytical method--better than 30 µg/silica gel tube--is required before any definitive statement can be made concerning BaP concentrations and any associated hazards to the worker(s).

Table 4 reveals that no alpha or beta naphthylamine (less than 0.001 mg/tube or approximately 0.05 mg/M^3) was detected in any of the eleven (11) air samples collected during the survey.

2. Medical

A review of the information obtained from the worker interviews (Table 5) revealed that nine (9) of the eleven (11) workers reported at least one previous episode of eye burning, redness or tearing, which they attributed mostly to creosote "fumes". In addition, four (4) workers reported some skin discoloration.

An examination of the worker(s) skin revealed no evidence of chloracne. However, two (2) workers had mild oil folliculitis and three (3) workers had "pitch" warts -- both conditions most probably due to creosote exposures. Three (3) workers had elevated blood pressure determinations; another two (2) workers had borderline elevated blood pressure determinations. Due to the small number of workers examined and the frequency of high blood pressure in black males of this age group, no conclusions regarding occupational causation can be drawn from these blood pressure determinations.

Results of the analyses of the urine samples for pentachlorophenol are shown in Table 6. These values ranged from 0.010 parts per million (lower detection limit) to 5.2 parts per million, with a mean of 0.95 parts per million. In a study of thirty (30) groups of pest control operators occupationally exposed to pentachlorophenol[3], the group means ranged from 0.028 - 12.990 parts per million, with a mean value for these groups of 0.082 parts per million. When compared to the above groups of workers, the mean value for workers in the Koppers Company, Incorporated study is less than mean values for fourteen (14) of these groups and greater than the mean value for sixteen (16) of the groups.

F. Conclusions

The following conclusions are based upon the previously-discussed environmental and medical findings:

1. Excessive air concentrations of particulate polycyclic organic material (PPOM), as related to coal tar solution, are present in the work atmosphere of the wood treating area.

2. Although this survey characterized some qualitative and quantitative data within current constraints, further development is necessary relative to sampling and analytical methodology to more fully qualitate and quantitate the exposures of workers in the wood treating area(s).

3. No evidence of chloracne from pentachlorophenol contaminants was found in the workers who were interviewed and examined.

4. Nine of the eleven workers who were interviewed and examined reported at least one previous episode of eye burning, redness or tearing, which they attributed to creosote "fumes".

5. Some exposed workers had oil folluculitis and "pitch" warts, probably from exposure to creosote.

6. Approximately 45% of the workers interviewed and examined had either elevated or borderline elevated blood pressure determinations. However, due to the small number of workers examined, and the frequency of this finding in black males of the applicable age group, the relationship to occupational exposures, if any, could not be determined from the results of this study.

V. RECOMMENDATIONS

Based on the findings from this study, the following recommendations are made:

1. It is suggested that the presently used creosote product be replaced with one containing a lesser amount of coal tar solution. Medical studies have shown that the chances of contracting skin, lung, kidney or bladder cancer are increased by employee exposure to products containing high percentages of coal tar volatiles. In addition, exposure to these agents may cause sunlight to have a more severe effect on the skin or may cause an allergic skin rash.

2. Workers exposed to pentachlorophenol, creosote, and coal tar pitch volatiles should be provided with impervious gauntlets and aprons.

3. Good personal hygiene is of prime importance. Employees should shower and wash thoroughly with soap and water at the end of each shift. A complete change of clothing should be made after showering, and only personal clothing should be worn from the plant to the home.

4. Fresh laundered work clothes should be worn daily.

5. Should the institution of engineering controls prove to be unseccesful, employees exposed to concentrations of 0.2 mg/M^3 or above of particulate polycyclic organic matter (PPOM), should wear respirators which are approved by NIOSH under provisions of 30 CFR, Part 11. The employer shall select and provide the appropriate respirator from

those listed below, and shall ensure that the employee(s) use the respirator provided.

a. Air-purifying respirator equipped with a high efficiency particulate filter.*

b. Powered air-purifying respirator equipped with a high efficiency particulate filter.*

c. Type C, positive pressure supplied-air respirator.

*High efficiency particulate filter denotes 99.97% efficient for 0.2 micron particles.

Respirators shall be used and maintained in accordance with Section 1910.134 of Subpart I - "Personal Protective Equipment," Title 29, CFR, Chapter XVII.

6. Nearly all the various chemical substances utilized in wood treating operations are highly toxic. The effects of long-term exposure to some of these substances are such that periodic medical monitoring is essential. In addition, the acute toxic nature of other such materials suggests that careful pre-placement health assessments be made prior to assigning men to the wood treating area.

a. Prospective employees should receive a pre-placement medical examination (including a complete medical history); fourteen by seventeen inch chest x-ray; forced vital capacity (FVC) test; forced expiratory volume, one second (FEV-1) test; urinary cytology determination; urinalysis (to include specific gravity, albumin, glucose and microscopic on centrifuged sediment); sputum cytology; hemogram; and a routine battery of clinical chemistries.

The physical examination should include emphasis on the lungs, liver, kidneys and skin. Persons with historic or present evidence of significant liver or kidney disease should be excluded from employment in the treating area. Those with active acne vulgaris should likewise be excluded.

b. On an annual basis, it is recommended that these procedures be repeated for all exposed employees.

VI. REFERENCES

1. Sawicke, E.; T. R. Hauser and T. W. Stanky; Int. J. Air Pollution, 2, 253 (1960).

2. Memorandum dated February 18, 1976, from Barry R. Belinky and Robert L. Larkin, Measurements Support Branch, Analytical Services Section, NIOSH, Cincinnati, Ohio.

3. Benenue, A; J. Wilson; L. J. Casarett; and H. W. Klemmer. "A Survey of Pentachlorophenol Content in Human Urine." Bulletin of Environmental Contamination and Toxicology, Vol. 2, No. 6, 1967, P. 319-332.

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Table 1
Pentachlorophenol Concentrations
Koppers Company, Incorporated
North Little Rock, Arkansas
February 24, 1976

Sample No.	Operation	Sampling Period(min)	*Type of Sample	**Concentration (mg/M^3)
A1	Hand Mix Oper.	112	GA	0.004
A3	Hand Mix Oper.	112	GA	0.004
A5	Sampling Man		EQUIPMENT FAILURE -VOID	
A6	Asst. Treater	442	P	0.001
A7	Laborer	445	P	0.001
A8	Laborer	438	P	0.006
A9	Treating Oper.	437	P	0.001
A10	Locomotive Oper.	339	P	<0.001
A2/12	Hand Mixer	110	P	0.008
A4/14	Hand Mix Oper.	112	GA	0.003

American Conference of Governmental Industrial Hygienists,
Threshold Limit Value Committee.....0.5

* GA - General Area; P-Personal
** mg/M^3 = milligrams of substance per cubic meter of air sampled

Table 2
Concentrations of
Particulate Polycyclic Organic Matter (PPOM)
Total Polynuclear Aromatics (PNA)
Koppers Company, Incorporated
North Little Rock, Arkansas
February 24-25, 1976

Sample No.	(Date)	Operation	Sampling Period(min)	*Type of Sample	**Concentration (mg/M^3) PPOM	Total PNA's
SM6	(2 -24-76)	Treating Oper.	285	P	0.26-0.35	0.03-0.13
SM7	(2 -24-76)	Asst. Treater	310	P	0.09-0.17	0.02-0.10
SM8	(2 -24-76)	Locomotive Oper.	285	P	0.23-0.31	0.02-0.10
SM9	(2 -24-76)	Locomotive Switch.	427	P	0.08-0.13	0.02-0.09
SM10	(2 -24-76)	Locomotive Switch.	334	P	0.07-0.14	0.02-0.10
SM11	(2 -25-76)	Treating Oper.	290	P	0.32-0.40	0.02-0.09
SM12	(2 -25-76)	Asst. Treater	300	P	0.16-0.23	0.02-0.06
SM13	(2 -25-76)	Locomotive Switch.	292	P	0.47-0.55	0.01-0.05
SM14	(2 -25-76)	Locomotive Switch.	292	P	0.28-0.36	0.02-0.07
SM15	(2 -25-76)	Locomotive Oper.	328	P	0.27-0.34	0.01-0.04
SM16	(2 -25-76)	Treating Area	260	GA	0.34-0.43	0.01-0.04
American Conference of Governmental Industrial Hygienists, Threshold Limit Value Committee.....					0.2	None

* GA - General Area; P-Personal
** mg/M^3 = milligrams of substance per cubic meter of air sampled

Table 3
Benzo(a)Pyrene Concentrations
Koppers Company, Incorporated
North Little Rock, Arkansas
February 24-25, 1976

Sample No.	(Date)	Operation	Sampling Period(min)	*Type of Sample	**Concentration (mg/M^3)
SM6	(2-24-76)	Treating Oper.	285	P	ND (a)
SM7	(2-24-76)	Asst. Treater	310	P	ND (a)
SM8	(2-24-76)	Locomotive Oper.	285	P	ND (a)
SM9	(2-24-76)	Locomotive Switch.	427	P	ND (a)
SM10	(2-24-76)	Locomotive Switch.	334	P	ND (a)
SM11	(2-25-76)	Treating Oper.	290	P	ND (a)
SM12	(2-25-76)	Asst. Treater	300	P	ND (a)
SM13	(2-25-76)	Locomotive Switch.	292	P	ND (a)
SM14	(2-25-76)	Locomotive Switch.	292	P	ND (a)
SM15	(2-25-76)	Locomotive Oper.	328	P	ND (a)
SM16	(2-25-76)	Treating Area	260	GA	ND (a)
SN6	(2-24-76)	Treating Oper.	285	P	ND (b)
SN7	(2-24-76)	Asst. Treater	310	P	ND (b)
SN8	(2-24-76)	Locomotive Oper.	285	P	ND (b)
SN9	(2-24-76)	Locomotive Switch.	427	P	ND (b)
SN10	(2-24-76)	Locomotive Switch.	334	P	ND (b)
SN11	(2-25-76)	Treating Oper.	290	P	ND (b)
SN12	(2-25-76)	Asst. Treater	300	P	ND (b)
SN13	(2-25-76)	Locomotive Switch.	292	P	ND (b)
SN14	(2-25-76)	Locomotive Switch.	292	P	ND (b)
SN15	(2-25-76)	Locomotive Oper.	328	P	ND (b)
SN16	(2-25-76)	Treating Area	260	GA	ND (b)
SN17	(2-25-76)	Treating Area	320	GA	ND (b)

merican Conference of Governmental Industrial Hygienists,
Threshold Limit Value Committee.....None

(a) None Detected - Lower detection limit, 30 µg/filter
(b) None Detected - Lower detection limit, 6/µg/silica tube

GA - General Area; P-Personal
*mg/M^3 = milligrams of substance per cubic meter of air sampled

Table 4
Alpha (α) and Beta (β) Napthylamine Concentrations
Koppers Company, Incorporated
North Little Rock, Arkansas
February 24-25, 1976

Sample No.	(Date)	Operation	Volume Sampled(liters)	*Type of Sample	**Concentration (mg/M^3)
S1	(2-24-76)	Sampling Man	13	P	< 0.08
S3	(2-24-76)	Laborer	21	P	< 0.05
S4	(2-24-76)	Laborer	22	P	< 0.05
S5	(2-24-76)	Treating Oper.	21	P	< 0.05
S6	(2-24-76)	Locomotive Oper.	19	P	< 0.05
S7	(2-25-76)	Treating Oper.	14	P	< 0.07
S8	(2-25-76)	Asst. Treater	17	P	< 0.06
S9	(2-25-76)	Locomotive Switch.	10	P	< 0.10
S10	(2-25-76)	Locomotive Switch.	15	P	< 0.07
S11	(2-25-76)	Locomotive Oper.	18	P	< 0.06
S12	(2-25-76)	Treating Area	7	GA	< 0.14

American Conference of Governmental Industrial Hygienists,
Threshold Limit Value Committee..... None

*GA - General Area; P-Personal
**mg/M^3 = milligrams of substance per cubic meter of air sampled

Table 5
Symptoms Reported by Workers
Koppers Company, Incorporated
North Little Rock, Arkansas
July 28-29, 1975

Symptom	Number of Workers Noting Symptoms Since Entering Koppers Company, Inc. Employment
Eye burning, redness or tearing	9
Skin discoloration	4
Frequent headaches	3
Frequent nausea	3
Skin blackheads	3
Weight loss	2
Increased need for sleep	2
Weight gain	2
Easy skin blistering	2
Complexion problems	2
Eye bruising	2
Dizziness	2
Weakness in legs	1
Stomach pains	1
Easy fatigability	1
Itching	1
Decreased sex drive	1
Skin pimples	1
Feeling of depression	1
Loss of apetite	0
Generally feeling bad	0
Swelling of eyelids	0
Numbness in legs	0
Increased amount of hair on face	0
Frequent diarrhea	0
Swelling around elbows or knees	0
Reddish urine	0
Leg Pains	0
Emotional disturbances	0
Decreased feeling in limbs	0
More easily excitable than in past	0

Table 6
Results of Analyses of Urine Samples
for Pentachlorophenol (PCP)
Koppers Company, Incorporated
North Little Rock, Arkansas
July 28-29, 1975

Sample No.	Pentachlorophenol (p.p.m.)*
1	0.760
2	2.000
3	0.730
4	0.110
5	5.200
6	0.590
7	0.180
8	< 0.010**
9	0.660
10	0.180
11	0.045
(a)12	< 0.010**
(a)13	< 0.010**
(a)14	< 0.010**
(a)15	< 0.010**

*p.p.m. - parts per million
**Lower limit of detection (0.010 p.p.m.)
(a) Controls