U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT HE 78-91-621

DRESSER INDUSTRIES, INC.
BRADFORD, PENNSYLVANIA

October 1979

I. TOXICITY DETERMINATION

A Health Hazard Evaluation was conducted by The National Institute for Occupational Safety and Health (NIOSH) at Dresser Industries, Inc., Bradford, Pennsylvania on October 24-26, 1978 and June 19-20, 1979. At the time of this evaluation, breathing zone and general area samples were collected for benzene, trichloroethylene, methyl ethyl ketone, naphthalene, total particulate, and dioctyl phthalate.

On the basis of environmental sampling in the workplace on October 24-26, 1978, it has been determined that the main line spray operators, coating operators, and the nylon dipper operators were exposed to excessive levels of total particulates above the prescribed health and safety criteria. All other environmental measurements were within the most recent evaluation criteria.

The irritative properties associated with dioctyl phthalate (DOP) chronic exposure were adversely affecting the workers. Complaints of nasal drainage (some blood tinged) were reported by 74% of the exposed workers. Dizziness was a complaint made by 53% of the exposed workers. Eye, nose, and throat irritation in over half of the dioctyl phthalate exposed workers, is consistent with the known properties of this chemical.

A follow-up study was conducted on June 19-20, 1979 after NIOSH sampling/analytical methods for DOP had been improved. At that time DOP was not detected in the work environment nor in bulk samples of the liquid plasticol. Further, health complaints previously occurring were not reported during this period.

Recommendations to aid in providing a safe and healthful working environment are included in Section V of this Determination Report.

II. DISTRIBUTION AND AVAILABILITY

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 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 the NIOSH Publications Office at the Cincinnati address.

Copies have been sent to:

a) Dresser Industries, Inc., Bradford, Pennsylvania
b) Authorized Representative of Employees - International Association of Machinists and Aerospace Workers - AFL-CIO (Local Lodge 1644)
c) U.S. Department of Labor - Region III
d) NIOSH - Region III

For the purpose of informing the approximately 50 "affected employees", the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any 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 of the International Association of Machinists and Aerospace Workers-AFL-CIO (Local Lodge-1644) regarding worker's exposure to smoke, fumes and dust in the plastic dip and spray coating of metal parts at the Dresser Manufacturing Division, Dresser Industries, Inc., 36 Davis Street, Bradford, Pennsylvania.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

Most of the Dresser piping products have two, sometimes three different coating materials, each with its own distinctive color, all part of the new Dresser Al-Clad Factory coating system - a technological development which selects the most suitable coating material - vinyl, epoxy, nylon - for each product part, according to its shape and function. Each individual part of the Dresser product is prepared using both grit blasting and chemical cleaning. To further insure integrity of coating bond and controlled surface conditions during processing and use, specific prime systems are employed. To assure proper polymerization of the plastic polymers, the coatings are applied under rigidly controlled conditions of application and oven cure.

Coating application is performed by a variety of methods, depending on type of coating material and part configuration. These methods include the following: 1) conventional air spray for primers, 2) hot dip plastisol for PVC plastisol application 3) fluid bed application of fusion bond materials and 4) electrostatic spray application of fusion bond materials.

The coating film polymerization insures that the optimum physical and chemical functions are developed for the particular material. This function is time-temperature dependent and is performed in curing installations equipped with multi-channel temperature read-outs.

The exact details of the processes used and the controls afforded to coat the various configurations are considered proprietary by Dresser.

B. Evaluation Design

An initial survey was conducted on June 22, 1978. This survey included obtaining background information and conducting a walk-through survey in the area where the alleged hazards were present. No aerometric sampling was performed during the initial survey. Bulk samples were collected of the plastic dip and the spray coatings.

A initial medical survey was conducted in conjunction with the walk-through survey. Meetings with company and union representatives elicited the following workers complaints; sore throat, bloody nose, and eye irritation. A subsequent interview with the plant nurse confirmed the above mentioned complaints. Workers' medical records were reviewed at random and showed a consistency with the above complaints. Five employees were interviewed on an individual basis. Three of the respondents complained of sore throat, burning eyes, and blood tinged mucous, while in the proximity to the plastisol operations. The other two workers complained of transient dizziness.

A SHEFS I report was distributed on July 13, 1978, reporting the findings to date and the future action to be taken.

A follow-up medical survey was conducted on August 10-11, 1978. The follow-up environmental survey was conducted on October 24-26, 1978 and June 19-20, 1979, in order to more fully evaluate employee exposure to substances mentioned in the earlier portion of this report.

C. Environmental Evaluation Methods

1. Environmental

Personal air samples were used to evaluate employee exposures. The personal samples were obtained by attaching a battery powered vacuum pump to the worker's belt with the sampling media (e.g., filter in a closed face cassette) in a holder attached to the shirt lapel of the worker to obtain a represenative sample of air in the breathing zone of the worker. Samples were obtained for a sufficient period of time so that for all practical purposes they may be considered as eight-hour time-weighted averages.

a. Total Particulate

Personal breathing zone and general area samples were collected by using MSA*, Model G. battery - operated vacuum pumps with tared 0.8 u pore diameter copolymer polyvinyl chloride acrylonitrile filter at a flow rate of 1.5 liters per minute. The sample weights were taken from a Perkin-Elmer Balance AD-2 to an accuracy of 0.01 mg.

The weight of the sample is determined by subtracting the tare pre-sample weight from the total weight.

b. Benzene, Naphthalene, Trichloroethylene and Methyl Ethyl Ketone

Exposure to these substances were determined with samples obtained by drawing air through charcoal tubes using Sipin* pumps operating at 50 cc/minute flow rate. The samples were desorbed with carbon disulfide and analyzed using a gas chromatograph with a flame ionization detector. The lower limits of detection per sample were as follows: 0.01 mg for benzene and naphthalene, 0.06 mg for trichloroethylene, and 0.08 mg for methyl ethyl ketone (MEK).

c. Dioctyl Phthalate (October 24-26, 1978)

Air was drawn through special fluorisil adsorbent tubes provided by NIOSH Laboratory by Sipin pumps operating at 50 cc/minute flow rate. The samples were separated into A and B sections, desorbed in 1 ml of a 1% 2-butanol-carbon disulfide solution containing an internal standard of 1 ug/ml octadecane, twenty-four hours were required to obtain the necessary level.

*Mention of commerical names or products does not constitute endorsement by the National Institute for Occupational Safety and Health

In anticipation of possible trace quantities of dioctyl phthalate retained within the glass sampling tube, the sample tubes were rinsed with solvent and analyzed for dioctyl phthalate residue. No residue was detected. The analysis was effected using a Hewlett-Packard 573IA Gas Chromatograph equipped with a flame ionization detector.

d. Dioctyl Phthalate (June 19-20, 1979)

Personnel breathing zone and general area samples were collected by using MSA, Model G battery-operated vacuum pumps using glass fiber filters (without backup pads) and florisil tubes in series at a flow rate of 50 cc, to determine in any DOP vapor, if present, would pass through the filter and then be collected by the florisil tubes.

All glass fiber filter samples were desorbed with 2 ml ethyl acetate and sonified. Florisil tubes, including the front glass fiber plug, were desorbed with 1 ml ehtyl acetate and sonified. A 6', 6% SP 2100 column held at 250°C isothermally was used for all gas chromatographic (FID) analyses. Under these operating conditions, as little as 10 ug DOP/ml could be detected.

2. Medical

Thirty-nine people participated in this study because of their close proximity to the plastic dip and spray coating operations. These thirty-nine persons comprise a three shift total. Nineteen individuals were seen from the first shift, eight from the second shift and twelve from the third shift. Each person was questioned using a standard respiratory questionnaire. This questionnaire included an occupational history, a current employment history, a medical history, and a smoking history. Symptoms that the individual thought may be job related were also sought.

In addition to the questionnaire, a physical exam was given to each study participant. Particular attention was given to the eyes, nose, throat, chest, and skin. Also, company medical records were obtained and reviewed on all study participants.

D. Evaluation Criteria

1. Environmental

To assess the potential toxicity of air contaminants in a place of employment, three primary sources of criteria are generally consulted: (1) NIOSH Criteria for Recommended Standards for Occupational Exposure to Substances (Criteria Documents); (2) Recommended and Proposed Threshold Limit Values (TLV's) and their Supporting Documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) 1978; and (3) Occupational Health Standards as Promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000).

In the following tabulation of criteria, appropriate values are presented.

Exposure Limits Presented in mg/M^{3*}

Substance	NIOSH	ACGIH TLV	OSHA Standard
Benzene	3.2**"c"	30	3.2 "c"
Trichloroethylene	134	535	535
Methyl Ethyl Ketone	590	590	590
Total Particulate		10	15
Dioctyl Phthalate		5	5
Naphthalene		50	50

*Milligrams of substance per cubic meter of air.
**In the case of benzene, OSHA has proposed to adopt the 3.2 mg/M^3 standard recommended by NIOSH, but the implementation of the reduced standard has been stayed by the courts.
"c" - Ceiling value and should never be exceeded.

TLV's or occupational health standards for substances are usually established at levels designed to protect workers occupationally exposed for an 8-hours per-day, 40 hours per week basis over a working lifetime. Because of a wide variation in individual susceptibility, some workers may experience ill effects at or below the designated levels. Thus, an evaluation of the workplace can not be based entirely upon comparisons made against such TLV's or standards, as various TLV's and Standards do not represent represent absolute protection of all workers. Setting of legal standards and enforcement is a responsibility of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).

2. Physiological

a. Dioctyl Phthalate

The liquid plasticol, nylon coating, and vinyl coating compounds all contain dioctyl phthalate. Dioctyl phthalate is one of the most widely used plasticizers and has received considerable toxicological investigation. The acute oral LD_{50} (lethal dose) in rats is 30 to 34 g/kg. The principal effect produced was that of soft liquid stools similar to those produced by mineral oil. At dietary levels below 13% there were no effects in rats during a two year feeding period. There were no increased incidences of tumors. Dioctyl phthalate in the form of dust, fume, or vapor is an irritant of the eyes, skin and respiratory tract. The irritant effects are worse on moist surfaces. Conjunctivitis and skin redness,, burning, and contact dermatitis may occur. If the chemical is held in contact with the skin, as under clothes or shoes, skin burns may develop. Hypersensitivity may develop in some individuals. Inhalation of the dust of vapors may cause coughing, sneezing, and a bloody nasal discharge. Repeated excessive exposure may result in bronchitis, emphysema, allergic asthma, hives, and chronic eye irritation.

b. Total Particulate

This is a term that is applied to the total dust in the air. It is very non-specific, however, at levels that exceed 10 mg/M^3, work conditions are very dusty and uncomfortable and can lead to coughing, sneezing, and respiratory irritation.

c. Benzene

Benzene as an acute poison produces narcotic effects. Chronic intoxication by benzene is one of the most serious diseases caused by the common hydrocarbon solvents. Its action is primarily on the bone marrow resulting in blood changes and, in serious cases, aplastic anemia, with a frequently fatal outcome. Benzene is a known carcinogen.

d. Trichloroethylene

Exposure to trichloroethylene vapor may cause irritation of the eyes, nose and throat. The liquid, if splashed in the eyes, may cause burning irritation and damage. Repeated or prolonged skin contact with the liquid may cause dermatitis. Trichloroethylene is a central nervous system depressant with reported addictive qualities. It is a suspected carcinogen.

e. Methyl Ethyl Ketone (MEK)

MEK is a widely used industrial solvent. Prolonged exposure above 590 mg/M^3 may cause mucous membrane irritation, nausea, vomiting, dermatitis, headache, and paresthesias. Workers strongly object to its odor. There have been few reports of serious ill effects.

f. Naphthalene

Naphthalene is a primary irritant and causes erythema and dermatitis upon repeated contact. It is also an allergen and may produce dermatitis in sensitive individuals. Direct eye contact with the dust has produced irritation and cataracts. Napthalene is a suspected carcinogen.

E. Evaluation Results and Discussion

1. Environmental

Results of the environmental samples showed that the main line spray operators, coating operators, and the nylon dipper operators were exposed to excessive levels of total particulates above the prescribed health and safety criteria. All other environmental measurement were within the most recent evaluation criteria. For a detailed description of sample results, please refer to Tables 1, 2, and 3.

The main spray operators, coating operators, and nylon dipper operators wore NIOSH approved respirators for nuisance particulates while performing their duties. The fact that a respirator was worn was not taken into consideration in calculating exposures. It can be assumed that exposures of these persons making proper use of prescribed respiratory protection were materially reduced from the calculated values.

Currently no NIOSH approved method is available for the analysis of dioctyl phthalate. Analytical methodology and analysis of DOP are currently in a developmental stage. An innovative method was devised to attempt to monitor airborne concentrations of DOP at Dresser MFG Division on October 24-26, 1978. Environmental measurements of DOP were deemed suspect, due to compounding problems experienced in analytical development, sampling technique, and a four month delay in sample analysis. Since the initial sample results showed a significant amount of DOP (greater that 1/3 of the total) in the B portion of the tubes, it was decided to develop a new analytical method and resample.

A follow-up environmental survey was conducted on June 19-20, 1979, expressly to monitor DOP, and more fully evaluate potential employee exposure to DOP. A bulk sample of the liquid plasticol was obtained and submitted for analysis. The NIOSH lab confirmed the absence of DOP in this sample. Operating conditions appeared normal during this revisit, and no worker voiced any health complaints to the industrial hygiene team. Twenty glass filter tubes plus nineteen florisil tubes were collected. No DOP was detected on any of these samples. This indicates there was no DOP exposure at the time of this follow-up evaluation. This "no exposure" finding is then clearly due to the removal of DOP as an ingredient from the liquid plasticol formulation.

2. Medical

Thirty-nine employees were interviewed during the medical evaluation, one female, and thirty-eight males. Their mean age was 33 years with a range from 22 to 57 years. The mean work years at Dresser was 5.8. The symptoms elicited are listed on a shift basis in Table 4.. Physical examination findings are presented in Table 5. A review of company medical records (pulmonary function tests) disclosed two individuals on the first shift with reduced lung capacities and a third with X-ray confirmed emphysema. Two individuals on the second shift had reduced lung capacities as well. All five of the above mentioned workers are current smokers. Yet their smoking can not obviate the fact that their exposure to dioctyl phthalate may further impair their respiratory function.

Both management and union voiced concern about an employee who had developed pulmonary disease while working at Dresser Industries. A review of his medical records revealed that chest X-rays and lung biopsy confirmed a diagnosis of sarcoidosis. It is unlikely that this is occupationally related.

3. Conclusions

Based on the results of environmental evaluations conducted by the National Institute for Occupational Safety and Health on October 24-26, 1978 and June 19-20, 1979, it has been determined that the main spray operators, coating operators and nylon dipper operators were exposed to excessive levels of total particulate above the NIOSH recommended standards and established Federal Standards. All other environmental measurements were within the most recent evaluation criteria.

The irritative properties associated with dioctyl phtahalate chronic exposure were adversely affecting the workers at Dresser Industries, Inc. Complaints of nasal drainage (some blood tinged) were reported by 74% of the workers. Dizziness was a complaint made by 53% of workers. The figures listed for cough, phlegm, shortness of breath and wheezing are strongly suggestive of an increased incidence of occupationally induced bronchitis.

Table 4 lists the findings provided by the physical examination given each study participant. The findings of eye, nose and throat irritation in over half the dioctyl phthalate exposed workers, speaks strongly of dioctyl phthalate irritant effects. Abnormal chest sounds discerned in 20% of those studied suggests effects consistent with exposure to dioctyl phthalate.

V. RECOMMENDATIONS

1. All work substances containing benzene (a known carcinogen), trichloroethylene (suspected carcinogen), and napthalene (a suspected carcinogen) should be used with great care. There is no known method for measuring or predicting a "safe" level of exposure to any carcinogen below which cancer will not result in any individual.

2. As good occupational medical practice, all workers should be given a yearly physical examination, urinalysis, a routine battery of clinical chemistries, and a pulmonary function test at company expense. A complete medical history should also be obtained. The data derived from these studies will provide consistant baseline information on all employees.

3. All local exhaust ventilation systems should be serviced regularly to insure that they are operating at maximum efficiency. Provide adequate ventilation for the main spray operators, coating operators, and nylon dipper operators until such time a full face air supplied respirator should be worn.

4. Personal protective equipment should be provided for employees exposed to hazards which cannot be adequately abated by engineering controls. At no time should personal protective equipment be substituted for engineering controls when engineering controls are feasible and are in accordance with required practice.

5. Employees should be routinely instructed in correct use and inspection of respirators. Respirators used should be those certified under the NIOSH Respirators Standard, 30 CFR, Part II. No individual with compromised lung function should be compelled to wear a respirator.

6. An educational program should be instituted so that employees are made aware of the hazards associated with organic solvents. Good work practices and first-aid procedures should be included in this program.

7. The present procedure of using air hoses to clean equipment and personal clothing should be discontinued and replaced with vacuum cleaning methods.

8. Better housekeeping is needed through the plant.

VI. REFERENCES

1. U.S. Department of Health, Education, and Welfare, PHS NIOSH; Occupational Diseases: A Guide to Their Recognition, U.S. Government Printing Office, June, 1977.

2. American Conference of Governmental Industrial Hygienists, Documentation of Threshold Limit Values for Substances in Workroom Air, Third Edition, 1971.

3. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II, Toxicology (2nd Ed., Revised 1967).

4. Calley, D. Et. Al.: "Toxicology of a Series of Phthalate Esters," Journal of Pharmaceutical Sciences, 55:158-162, 1966.

5. Singh, A.E., et. al.: "Teratogenicity of Phthalate Esters in Rats," Journal of Pharmaceutical Science, 61:51-55, 1972.

6. Epstein, Samuels, "The Politics of Cancer", Sierra Club Books, San Francisco, California.

VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By:

Raymond L. Ruhe
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluation and
Technical Assistance Branch
Cincinnati, Ohio

Mike Donohue
Physician Assistant - Certified
Medical Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch
Acting Chief
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Acknowledgements

Medical Evaluation:

Linda Shea
Clinical Nurse
Medical Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Environmental Evaluation:

James McGlothlin
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Analytical Laboratory Services:

Measurement Support Branch
Cincinnati, Ohio

Report Typed By:

Linda Morris
Clerk-Typist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

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Table I

Results of Environmental Sampling

Dresser Manufacturing Division
Bradford, Pennsylvania

October 23-26, 1978

Job and/or Location	Date	Sampling Period	Sample Volume (liters)	Type	Benzene mg/M^3	Trichloro-Ethylene mg/M^3	Methyl Ethyl Ketone mg/M^3	Naphthalene mg/M^3
cutter (liquid plasticol)	10-23-78	0028-0733	97.8	**BZ	****LD	LD	LD	LD
cutter (liquid plasticol)	10-23-78	0023-0732	94.9	BZ	LD	LD	LD	LD
cutter (liquid plasticol)	10-23-78	0035-0731	92.7	BZ	LD	LD	LD	LD
coating operator	10-23-78	0031-0735	92.3	BZ	LD	LD	3	LD
line loader	10-23-78	0026-0743	92.4	BZ	LD	LD	1	LD
spray primer	10-23-78	0025-0730	92.5	BZ	LD	13	30	LD
inspector	10-23-78	0024-0729	91.1	BZ	LD	LD	LD	LD
unloader main line	10-23-78	0855-1030	15.1	BZ	LD	DD	LD	LD
unloader main line	10-23-78	0856-1501	80.1	BZ	LD	LD	25	LD
napco operator	10-23-78	0901-1458	81.3	BZ	LD	LD	4	LD
entrance to oven	10-23-78	0914-1505	78.6	***GA	LD	LD	LD	LD
load & unload main line	10-23-78	1054-1500	56.1	GA	LD	LD	LD	LD
spray primer	10-25-78	0028-0739	93.3	BZ	LD	LD	26	LD
nylon primer	10-25-78	1638-2348	102.2	BZ	LD	LD	11	LD
napco area	10-26-78	0021-0813	108.1	GA	LD	LD	LD	LD
NIOSH Recommended Standard as a part of NIOSH Testimony at OSHA hearing								
The NIOSH 1976 Criteria Document					3.2	134		
The 1978 ACGIH TLV and current OSHA Standard							590	
The 1978 ACGIH TLV and current OHSA Standard								50

* mg/M^3 - milligrams of substance per cubic meter of air
** BZ - Breathing Zone
*** GA - General Area
**** LD - Less than detectable limits

Benzene - Limit of Detection 0.01 mg/sample
Trichloroethylene - Limit of Detection 0.06 mg/sample
Methyl Ethyl Ketone - Limit of Detection 0.08 mg/sample
Naphtha - Limit of Detection 0.01 mg/sample

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Table II

Results of Environmental Sampling

Dresser Manufacturing Division
Bradford, Pennsylvania

October 24-25, 1978

Job and/or Location	Date	Sampling Period	Sampling Volume (liters)	Type	Total Particulate *mg/M^3
napco operator	10-24-78	0903-1458	532	**BZ	1
coating operator (grey epoxy)	10-24-78	0848-1505	565	BZ	50
utility operator	10-24-78	0854-1502	552	BZ	1
spray area main line	10-24-78	0910-1506	534	***GA	1
coating operator (grey epoxy)	10-24-78	0845-1514	583	BZ	96
spray area main line	10-25-78	0033-0730	625	GA	2.
main line sprayer	10-25-78	0037-0733	624	BZ	70.
main line sprayer	10-25-78	0041-0730	613	BZ	142.
nylon dipper operator	10-25-78	1615-2346	676	BZ	11.
nylon dipper operator	10-25-78	1622-2347	667	BZ	6.

The 1978 ACGIH TLV 10

The current OSHA standard is 15 mg/M^3

*mg/M^3 - milligrams of substance per cubic meter of air.
**BZ - breathing zone
***GA - general area

Total particulate - Limit of Detection 0.01 mg/M^3

Table III

Results of Environmental Sampling

Dresser Manufacturing Division
Bradford, Pennsylvania

October 24-25, 1979
June 19-20, 1979

Job and/or Location	Date	Sampling Period	Sample Volume (liters)	Type	Dioctyl Phthalate *mg/M^3
cutter (liquid plasticol)	10-24-78	0020-0738	91.8	**BZ	0.4
inspector (liquid plasticol)	10-25-78	0022-0738	53.3	BZ	0.9
cutter (liquid plasticol)	10-25-78	0017-0739	27.6	BZ	3.2
line loader (liquid plasticol)	10-25-78	0023-0741	84.2	BZ	1.2
cutter (liquid plasticol)	10-25-78	0020-0740	86.6	BZ	0.8
main line (nylon dip)	6-19-79	2410-0555	202.0	***GA	****LD
main line (nylon dip)	6-19-79	2410-0555	202.0	GA	LD
NAPCO (control panel)	6-19-79	2414-0550	198.0	GA	LD
pump on desk (liquid plasticol)	6-20-79	0845-1114	74.0	GA	LD
pump on control panel (liquid plasticol)	6-20-79	0845-1114	74.0	GA	LD
set up man (liquid plasticol)	6-20-79	0925-1117	56.0	BZ	LD
utility operator (liquid plasticol)	6-20-79	0922-1117	51.0	BZ	LD
loader (liquid plasticol)	6-20-79	0924-1117	56.0	BZ	LD
main line (nylon dip)	6-20-79	0612-0913	90.0	GA	LD
main line (nylon dip)	6-20-79	0612-0913	90.0	GA	LD
NAPCO (control panel)	6-20-79	0615-1005	115.0	GA	LD
set up operator (liquid plasticol)	6-20-79	0033-0513	106.0	BZ	LD
set up operator (liquid plasticol)	6-20-79	0035-0513	112.0	BZ	LD
utility operator (liquid plasticol)	6-20-79	0035-0513	101.0	BZ	LD
loader operator (liquid plasticol)	6-20-79	0037-0513	100.0	BZ	LD
pump on desk (liquid plasticol)	6-20-79	0030-0514	142.0	GA	LD
pump on control panel (liquid plasticol)	6-20-79	0030-0514	142.0	GA	LD
The 1978 ACGIH TLV, the Current OSHA Standard					5.0

*mg/M^3 - milligrams of substance per cubic meter of air
**BZ - breathing zone
***GA - general area
****LD - less than detectable limits

Dioctyl Phthalate - Limit of detection - 10 µg DOP/Florisil tube and less than 20 µg DOP/Filter

TABLE IV

Examination Findings

Dresser Industries, Inc.
Bradford, Pennsylvania

Physical Findings	SHIFT 1 #positive findings	SHIFT 1 %	SHIFT 2 #positive findings	SHIFT 2 %	SHIFT 3 #positive findings	SHIFT 3 %	#positive findings total	percentage of 39 participants
Eye irritation	11	58	4	50	7	58	22	56
Nose irritation	7	37	5	63	7	58	19	49
Throat irritation	12	63	5	63	4	33	21	54
Abnormal chest sounds (Crhonchus)	5	26	1	13	2	17	8	21
Skin rash	3	16	1	13	—	—	4	10

TABLE V

Symptoms Elicited in Workers

Dresser Industries, Inc.
Bradford, Pennsylvania

Symptoms	SHIFT 1 #positive responders	%	SHIFT 2 #positive responders	%	SHIFT 3 #positive responders	%	#positive responders total	percentage of 39 participants
Cough	6	32	4	50	2	17	12	31
Phlegm production	7	37	2	25	4	33	13	33
Dizziness (transient)	10	53	4	50	7	58	21	54
Shortness of breath	5	26	2	25	2	17	9	23
Wheezing	8	42	2	25	1	8	11	28
Weather affect chest	4*	21	1*	13	2*	17	7	18
Nasal drainage/blood	12**	63	8**	100	9**	75	29	74
Pleurisy			1	13	1	8	2	5
Pneumonia	7	37	2	25	2	17	11	28
Bronchitis	4	21	1	13	2	17	7	18
Asthma	2	11			1	8	3	8
Emphysema	1	1					1	3
Chemical fume exposure	7***	37	7	88	5***	42	19	49
Smoking History	9	47	5	63	8	67	22	56

*Weather affect chect - "high humidity" by all respondents.

**Bloody nasal discharge - 3 individuals on each shift.

***Chemical fume exposure - 1 individual from auto emmissions
all others stated exposure occurred at Dresser.