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 NO. 77-13-414

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I. TOXICITY DETERMINATION

A Health Hazard Evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on March 23, 1977, in the Lancaster, Pennsylvania shop of Tee Printing. Environmental samples were collected to determine concentrations of vinyl chloride monomer, dioctylphthalate, lead and total dust found in the silk screening operation.

Based on the results of these environmental samples at the time of this survey, it was determined that employees in this shop are not routinely exposed to hazardous concentrations of these substances. However, due to concern about occasional irritation from airborne contaminants, especially in bad weather, it is recommended that an exhaust system be installed around the oven.

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 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 address.

Copies of this report have been sent to:

a) Tee Printing, Lancaster, Pennsylvania
b) U.S. Department of Labor - Region III
c) NIOSH - Region III

For the purpose of informing the approximately three "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 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 received such a request from an authorized representative of management of Tee Printing regarding the presence of vinyl chloride monomer in rubber based inks containing polyvinyl chloride.

IV. HEALTH HAZARD EVALUATION

A. Process Description

Tee Printing does silk screening on shirts in an operation that can be separated into three steps. First, the shirts are placed on a press where they are stretched and silk screened in up to three colors. The only materials used in this plant are the inks and the shirts. The inks, which come from various suppliers, are all approximately equal mixtures of a plasticizer (usually dioctylphthalate), polyvinyl chloride (PVC), and pigments. The black ink, which according to employees is the most irritating, was suspected to contain a small amount of lead.

In the second step of the silk screening process the printed shirts are placed on a conveyor which carries them through an oven where the inks are cured at up to 300°F. Although this temperature is probably not high enough to volatilize any lead or decompose PVC, a haze was observed around the oven openings, possibly the result of the plasticizer.

The third step of this process is sorting and packing the shirts for shipment. This step involves no new exposures.

B. Evaluation Design

Personal breathing zone samples were collected for total dust, lead, vinyl chloride, and dioctylphthalate (DOP) on the three workmen involved in the silk screening process. Also, breathing zone samples were collected on the NIOSH Industrial Hygienist and general area samples were collected. Full shift samples were taken when possible. Dust and lead samples were collected using battery powered personal sampling pumps operated at 1.5 liters per minute (lpm). The contaminants were trapped on pre-weighed 37 mm vinyl metricyl filters in closed face cassettes, and analysis was done by reweighing and subtracting the tare weight for dust, and by atomic absorption for lead.

Vinyl chloride was collected on activated charcoal. Battery powered personal sampling pumps with a flow rate of 200 cc/min were used to draw air through the charcoal tubes. Analysis was by gas chromatography following desorption by carbon disulfide.

Dioctylphthalate (DOP) was collected on glass fiber filters in closed face cassettes in series with fluorosil tubes. Battery powered personal sampling pumps with a rate of 0.5 lpm were used to draw air through the collection system. The DOP was desorbed from both filter and fluorosil with carbon disulfide and analysis was by gas chromatography.

C. Evaluation Criteria

NIOSH supports OSHA's recommendation that occupational exposure to lead not exceed 0.10 mg/M^3 for an eight hour average.[1] NIOSH recommends that occupational exposure to vinyl chloride monomer remain below concentrations detectable by current technology.[2] There is no NIOSH recommendation for either total dust or DOP, although the American Conference of Governmental Industrial Hygienists (ACGIH) recommends a limit of 10 mg/M^3 for dust which contains no toxic impurities.[3] DOP is thought to be of relatively low toxicity and a concentration of 5 mg/M^3 has been stated to produce irritation of upper respiratory passages.[4,5]

D. Evaluation Results, Conclusions, and Recommendations

All six lead and seven vinyl chloride samples were below the limits of detection of instruments used for analysis. All lead samples were less than 0.002 mg/M^3 and all vinyl chloride samples were less than 0.0002 mg/M^3. One DOP sample, taken at the exit end of the oven, indicated a concentration of 0.6 mg/M^3 in that area, but all personal samples and all other area samples for DOP were less than 0.2 mg/M^3. Total dust concentrations are listed below:

Locations	Milligrams Dust per Cubic Meter
Breathing Zone of Press Operator	2.5
Breathing Zone of Press Loader/Unloader	2.3
Breathing Zone of Sorter/Packer	1.7
Breathing Zone of NIOSH Industrial Hygienist	1.8
Area Sample - Oven Exit	5.3
Area Sample - Oven Entrance	1.9

A comparison of these results with the criteria in the previous section indicates all exposures are below recommended maximum levels. Due, however, to unsolicited complaints of occasional irritation, especially during cold weather, it is recommended that local exhaust ventilation be installed to remove the smoke from the oven area.

V. REFERENCES

1. Statement of Edward J. Baier, Deputy Director, NIOSH, before the Department of Labor OSHA Public Hearing on Occupational Lead Standard, March, 1977.

2. NIOSH Recommended Standard for Occupational Exposure to Vinyl Chloride, March, 1974.

3. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1976, American Conference of Governmental Industrial Hygienists.

4. International Labor Office, Encyclopedia of Occupational Safety and Health. McGraw Hill Book Company, New York, 1972.

5. Patty, F.A., Ed., Industrial Hygiene and Toxicology, Vol. 2, Interscience Pub., 1963.

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