

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service
Centers for Disease Control • National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 85-137-1648
HIRSCHFIELD PRESS
DENVER, COLORADO

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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 Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 85-137-1648
January 1986
HIRSCHFIELD PRESS
DENVER, COLORADO

NIOSH INVESTIGATION
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- I. In February 1985, the National Institute for Occupational Safety and Health (NIOSH) received a request from Local 440M of the Graphic Communication International Union to evaluate solvent exposures in the Toshiba Press area of Hirschfield Press, Denver, Colorado.

On March 1, a NIOSH investigator performed an environmental investigation. This investigation consisted of breathing zone and general room air measurements for petroleum naphtha, toluene, isopropanol, and methanol. Twelve of the workers were interviewed with questions directed towards symptoms caused by petroleum naphtha, toluene, isopropanol, and methanol.

All breathing zone and general room air concentrations for petroleum naphtha, toluene, isopropanol, and methanol were well within evaluation criteria. The average level of petroleum naphtha was 53 mg/M³ with a high of 106 and a low concentration of 18 mg/M³. The average concentration of toluene was 0.9 mg/M³ with a high of 2 mg/M³ and a low of less than 0.01 mg/M³. The average concentration of isopropanol was 17 mg/M³ with a high of 33mg/M³ and a low of 3 mg/M³. Two samples were analyzed for methanol; one was below the detection limit of 0.01 mg/sample, the other was 0.4 mg/M³. The threshold for mixtures was not exceeded. Results of the interviews showed complaints were due to the specific times when the afterburner on the press was not working. All results were verbally reported to management and union officials in April, 1985.

On the basis of the environmental data and employee interviews, it was determined that there was no health hazard during the time of this evaluation. Recommendations that can help eliminate employee complaints are included in this report.

KEYWORDS: 2751 (Commercial printing) petroleum naphtha, toluene, isopropanol, methanol.

II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a request in February 1985 from the Graphic Communications International Union, Local 440M to evaluate solvent exposure in the Toshiba Press area at Hirschfield Press, Denver, Colorado. The results of this evaluation were discussed with union and management in April, 1985.

III. BACKGROUND

Hirschfield Press is one of the largest printing facilities in the western United States. They print such items as TV Guide, cookbooks, special inserts for newspapers, books of various kinds and information, maps and guides for ski resorts. The area in which this evaluation was performed involved the Toshiba press. An investigation on the various inks and dyes showed very few toxic chemicals, namely: petroleum naphtha, toluene, isopropanol, and methanol. These substances are used either for cleaning the printing press or as a solvent for the various inks. This area employs only five to six workers per shift. All workers wore sampling pumps for monitoring of the solvents used in the area.

IV. ENVIRONMENTAL DESIGN AND METHODS

A. Environmental

Twelve samples for petroleum naphtha, toluene, and isopropanol were collected on organic vapor charcoal sampling tubes using vacuum pumps operated at 50cc/minute. NIOSH method 1550 was used for sampling petroleum naphtha, NIOSH method 1501 was used for toluene, NIOSH method 1400 was used for isopropanol, and NIOSH method 2000 was used for the two methanol samples. Methanol was collected on silica gel tubes using vacuum pumps operated at 50cc/minute. All twelve workers were interviewed and eleven were monitored for airborne contaminants.

V. EVALUATION CRITERIA

A. Environmental

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure

to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications, or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8 - to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

Environmental Exposure Limits
8-Hour Time-Weighted Average (TWA)

| | <u>mg/M3</u> | | |
|-------------------|--------------|-------------|--------------|
| | <u>NIOSH</u> | <u>OSHA</u> | <u>ACGIH</u> |
| Petroleum naphtha | 350 | * | * |
| Toluene | 375 | 750 | 375 |
| Isopropanol | 980 | 980 | 980 |
| Methanol | 260 | 260 | 260 |

mg/M³ = milligrams of substance per cubic meter of air.

* = no evaluation criteria

B. Toxicology

Petroleum Naphtha - This solvent usually contains a variety of petroleum compounds. It is usually an aliphatic carbon with a toxicity similar to that of Stoddard solvent which has an OSHA standard of 525 mg/M³. It can cause defatting dermatitis, liver damage, follicular dermatitis, narcosis, burning of the eyes, and irritation of the respiratory system even at levels of 200 to 300 mg/M³. The use of this material at Hirschfield Press as a cleaning solvent should be performed under adequate ventilation. This would prevent exposure to excessive levels and eliminate employee complaints.

Toluene⁽¹⁾ is toxic by all three routes of entry into the human body. Acute exposure produces irritation of the eyes, respiratory tract and skin. At high concentrations it may cause fatigue, weakness, confusion, headache, dizziness, and drowsiness. Chronic exposure will lead to cracking of the skin. Examination of the central nervous system, liver, and kidneys should be stressed on physicals provided to workers exposed to toluene.

Isopropanol⁽²⁾ is toxic if swallowed or inhaled. It may cause mild irritation of the eyes, nose, and throat. Swallowing isopropanol may lead to unconsciousness and death. Drying and cracking of the skin may occur from prolonged exposure. Isopropanol is used as a rubbing alcohol and for various medicinal purposes.

Methanol⁽³⁾ - Acute exposure to methanol may cause eye irritation, skin dryness, weakness, headache, drowsiness, nausea, vomiting, blurred vision, and even death--especially if swallowed. Chronic exposure to high levels of methanol may produce blindness, liver disease, and kidney disease. Direct skin contact with methanol may produce dermatitis, erythema, and scaling.

VI. RESULTS AND DISCUSSION

On March 1, 1985, an environmental investigation with employee interviews was performed at Hirschfield Press in Denver, Colorado. Eleven breathing zone and one general room air samples were collected for petroleum naphtha, toluene, and isopropanol. Two breathing zone air samples were collected for methanol. Samples were collected on eleven workers operating and maintaining the Toshiba Press. The average concentration of petroleum naphtha was 53 mg/M3 with a high of 106 mg/M3 and a low of 18 mg/M3. The average level of toluene was 0.9 mg/M3 with a low of less than 0.01 mg/sample and a high of 2 mg/M3. The average concentration of isopropanol was 17 mg/M3 with a high of 33 mg/M3 and a low of 3 mg/M3. Methanol was only found in one sample at a concentration of 0.4 mg/M3. All eleven Toshiba Press workers were interviewed. Employee interviews showed respiratory irritation when the afterburner on the Toshiba Press was not working. This occurs very rarely and was not occurring on the day of this survey.

All environmental data are presented in table 1.

VII. CONCLUSIONS

Review of environmental data, employee interviews, and observations made during this evaluation indicate that there was no health hazard in the vicinity of the Toshiba Press on March 1, 1985. It should be noted that this hazard evaluation was limited to the Toshiba Press area and does not address other work areas of Hirschfield Press Company.

VIII. RECOMMENDATIONS

1. Employees should be informed about the chemicals they use to maintain and operate the Toshiba Press.
2. Eating, drinking, and smoking should not be permitted in the work area. (Eating and drinking in the work place was common during this survey and was being done with very dirty hands.)
3. Respiratory protection should be provided when the afterburner malfunctions.

IX. REFERENCES

1. NIOSH/OSHA occupational health guideline for toluene, pp. 1-5.
2. Ibid, pp. 1-5.
3. Ibid, pp. 1-5.

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 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 NIOSH, Publications Office, at the Cincinnati address.

Copies of this report have been sent to:

1. Hirschfield Press
2. U.S. Department of Labor/OSHA, Region VIII
3. NIOSH, Region VIII
4. Colorado Department of Health

For the purpose of informing affected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

Table I

Breathing Zone & General Air Concentration of Petroleum Naphtha,
Toluene, & Isopropanol at Hirschfield Press, Denver, Colorado
March 1, 1985

| <u>Sample #</u> | <u>Job</u> | <u>Sampling Time</u> | <u>Mg/M³</u> | | |
|---|------------------------|----------------------|--------------------------|----------------|--------------------|
| | | | <u>Petroleum Naphtha</u> | <u>Toluene</u> | <u>Isopropanol</u> |
| 1 | Press (ink fountain) | 7:05 - 10:20 | 77 | 2 | 12 |
| 2 | Asst. Press Opr. | 7:05 - 10:35 | 40 | 1 | 13 |
| 3 | Asst. Roll Tender | 7:06 - 10:37 | 40 | * | 15 |
| 4 | Jogger I | 7:12 - 2:00 | 45 | 1 | 13 |
| 5 | Jogger II | 7:15 - 10:50 | 25 | * | 3 |
| 6 | Asst. Press Helper | 7:17 - 10:47 | 43 | 1 | 29 |
| 7 | Foreman | 7:20 - 12:02 | 18 | 1 | 17 |
| 9 | Gen. Area (press area) | 7:35 - 1:00 | 83 | 1 | 18 |
| 12 | Asst. Press Opr. | 10:35 - 2:00 | 87 | 1 | 33 |
| 13 | Asst. Roll Tender | 10:37 - 2:05 | 106 | 2 | 20 |
| 16 | Asst. Press | 10:45 - 2:06 | 43 | 1 | 16 |
| 15 | Jogger II | 10:50 - 2:07 | <u>27</u> | <u>*</u> | <u>16</u> |
| Evaluation Criteria | | | 350 | 375 | 980 |
| Laboratory limit of detection mg/Sample | | | 0.1 | 0.01 | 0.01 |