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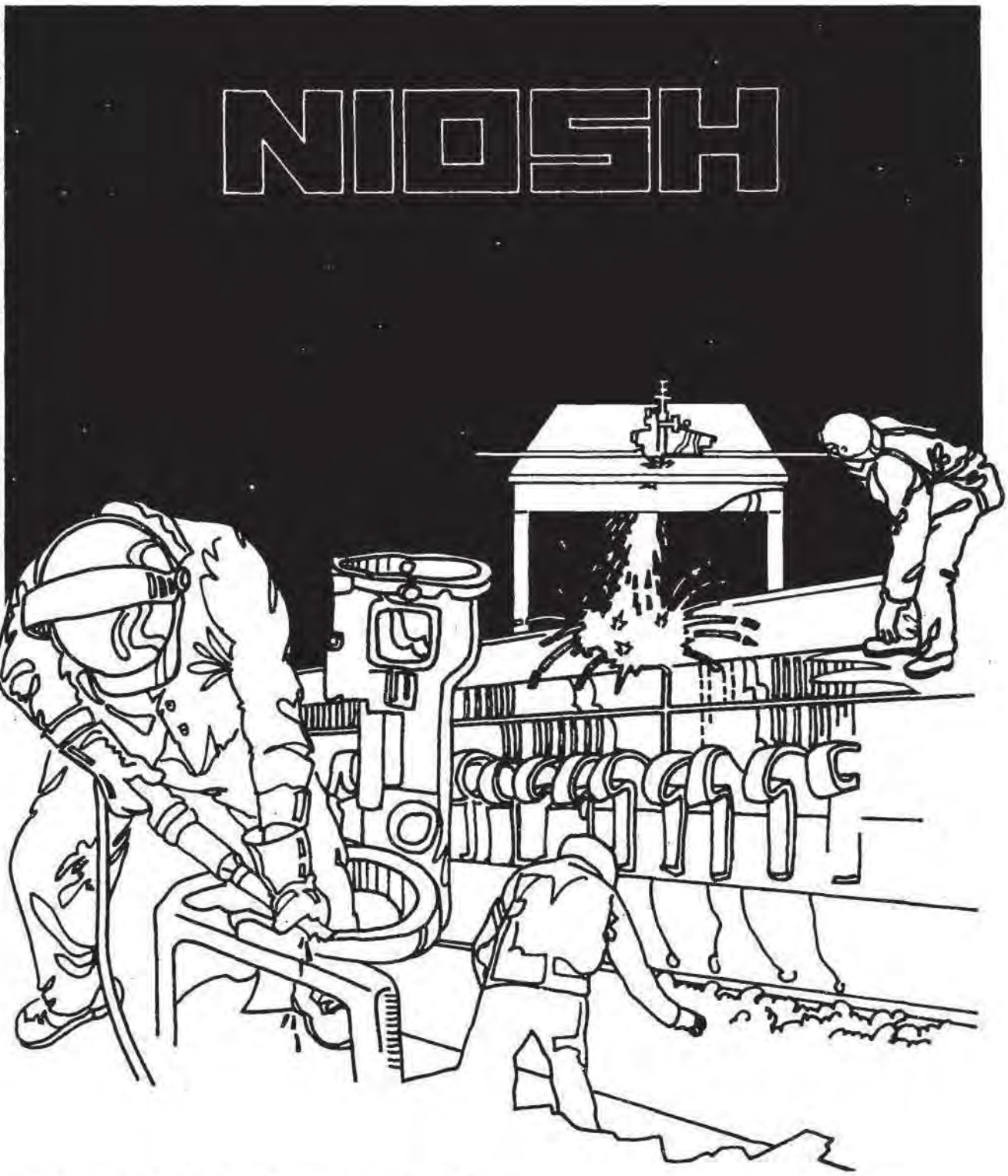

Health Hazard Evaluation Report

HETA 82-008-1226
ARTS CONSORTIUM
CINCINNATI, OHIO

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.

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ARTS CONSORTIUM
CINCINNATI, OHIO

NIOSH INVESTIGATORS:
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I. SUMMARY

On October 2, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a Health Hazard Evaluation from employees at the Arts Consortium, Cincinnati, Ohio. The request stated that workers were concerned about solvent vapors generated by operating and cleaning an offset printer. Generally, only one person operated the printer on an intermittent schedule - two to four hours per day, one to four days every two weeks.

On November 5, 1981, a walk-through of the work site was conducted to observe conditions of exposure and collect information on the chemicals used in operating the offset printer. A follow up survey was conducted on November 10, 1981. This survey was designed to (1) measure worker exposure to the vapors emitted from the cleaning solvent identified as "Quick Wash 104", (2) evaluate work practices, and (3) determine the level and extent of the reported health effects by interviewing the workers using a standard, non-directed, medical questionnaire.

"Quick Wash 104" was found to be a mixture of aliphatic and aromatic type naphthas, plus methylene chloride. Area air samples for methylene chloride ranged from non-detectable to 15.9 milligrams per cubic meter (mg/m^3) while personal breathing zone samples ranged from 2.7 to 36.9 mg/m^3 for the periods sampled (15 minutes - three hours). All were well below the NIOSH recommended exposure criteria of 261 mg/m^3. Total naphtha, of which 40% was estimated to be aromatic, air samples ranged from 7.3 - 229 mg/m^3 for area samples and 94.0 - 258 mg/m^3 for personal breathing zone samples. Since the aromatic content was greater than 20%, the NIOSH criteria of 350 mg/m^3 cannot be applied. In general, the higher the aromatic content the more toxic the solvent. One aromatic naphtha (tri-methyl benzene) detected has an exposure criteria of 125 mg/m^3 (ACGIH-TLV).

Observation of work practices indicated deficiencies such as: containers of cleaning solvent were left uncovered, no protective clothing such as gloves or respirators were available or used during cleaning procedures, and the solvent was being used in a poorly ventilated area. Three workers who were interviewed frequently experienced headache, dizziness, and skin irritation when using the solvent-based cleaner.

Using the solvent-based cleaner in a very poorly ventilated area and without proper protective gear constitutes a health hazard. Although the exposure levels do not exceed exposure criteria on an 8-hour basis, intermittent higher exposures could cause the reported symptoms which are typical of those associated with solvent exposures. Recommendations on how to minimize solvent exposure through the use of engineering controls and protective gear are presented in Section VIII.

KEYWORDS: SIC 2752 (Commercial Printing, Lithography) methylene chloride, naphthas, offset printing

II. INTRODUCTION

In October 1981, NIOSH received a request from employees at the Arts Consortium, Cincinnati, Ohio to evaluate employee exposures to solvent vapors emitted during the cleaning of an offset printer. A NIOSH industrial hygienist visited the work site on November 5 and 10, 1981, to evaluate the use and cleaning of the printer. Recommendations to relocate the printer to an area that had better ventilation or to provide adequate ventilation at the current printer location were made at the closing conference on November 10, 1981.

III. BACKGROUND

The Arts Consortium is a community cultural center which opened in 1975 in the Cincinnati area. The purpose of the center is to develop interest in and support for the creative and performing arts. There are 12 full-time and 18 part-time employees at the center. Jobs at the center include: director, public relations, writer/editor, graphic art designer, office manager, supervisors, and clerical workers.

Of particular concern at the facility was the offset printing area which was a converted cold storage room (the facility used to be a Kroger Store). The room was 12' x 15' x 9' and had one entry door and no ventilation. One employee operated the printer as needed, generally working two to four hours for a couple of days every two weeks to print pamphlets and bulletins. Several times a year the printer is used up to six hours per day for two week periods. To prevent ink from accumulating on the print plates they are cleaned with a solvent-based cleaner which has a trade name of "Quick Wash 104".

IV. EVALUATION DESIGN AND METHODS

Workers exposure to the solvent's vapors emitted during the cleaning of the offset printer was evaluated by (1) evaluating work practices, (2) conducting environmental sampling and, (3) interviewing employees who worked in the offset printing area.

Environmental sampling consisted of personal and area air samples obtained as partial period consecutive samples. The collection media (activated charcoal) was enclosed in glass tubes which were connected via tygon tubing to battery operated pumps. The sampling trains were calibrated to operate at either 50 or 100 cc/min and analyzed in accordance with NIOSH Sampling Method P&CAM 127. Several short term (15 minute) samples were obtained to monitor ceiling level exposures.

Prior to analyzing the air samples, bulk samples of the liquid "Quick Wash 104" were analyzed by gas chromatography/mass spectroscopy (GC/MS) techniques to determine its chemical components. The air samples were analyzed for those substances identified in the qualitative analysis.

V. EVALUATION CRITERIA

A. Methylene Chloride

Repeated contact with methylene chloride can cause dry, scaly, and fissured dermatitis. The liquid and vapor are irritating to the eyes and upper respiratory track at higher concentrations. If the liquid is held in contact with the skin it may cause skin burns. Methylene chloride is a mild narcotic. Overexposure can result in headache, giddiness, irritability, and numbness in the limbs.

The OSHA standard is 1740 mg/m^3. Studies in the 1970's demonstrated that methylene chloride is metabolized in the body to carbon monoxide, ultimately causing an elevation in carboxy hemoglobin and it is on the basis of these studies that NIOSH has recommended an exposure criteria of 261 mg/m^3. As part of this recommendation, as well as to account for the concomitant effects of methylene chloride and CO, NIOSH recommends that where CO exposure is greater than 9 ppm, the CO and methylene chloride exposures should be considered as having additive effects.

B. Naphthas

Naphthas are derived from both petroleum and coal tar. Petroleum naphthas are composed of principally aliphatic hydrocarbons whereas those derived from coal tar are primarily aromatic hydrocarbons.

Naphthas are irritating to the skin and mucous membranes of the upper respiratory system. Skin "chapping" and photosensitivity may develop after repeated contact with the liquid. If confined against the skin by saturated clothing, naphthas may cause skin burns. Overexposure to naphthas can cause central nervous system effects such as headache, dizziness, and nervousness. One chemical component sometimes found in naphthas, n-hexane, has been associated with peripheral neuropathy (degenerative disease of the nerves in extremities). Another, benzene, may produce blood changes such as leukemia or aplastic anemia.

Petroleum naphtha has a lower order of toxicity than that derived from coal tar due to lower aromatic content. In general, naphthas with an aromatic fraction of less than 20% are considered petroleum naphthas. NIOSH has recommended an exposure criteria of 350 mg/m^3 for petroleum type naphthas. The OSHA standard is 2000 mg/m^3. OSHA also has a standard of 400 mg/m^3 for coal tar naphthas.

VI. RESULTS AND DISCUSSION

A. Work Practices

Labels found on the solvent container advised the user to keep the contents closed, use only with adequate ventilation, avoid breathing vapors and avoid prolonged or repeated skin contact.

None of the precautions were followed. The solvent was used in a very poorly ventilated area (converted cold storage room), the containers were left open and no personal protective gear was used. The printer operator noted he had to frequently leave the area to obtain fresh air.

B. Environmental Sampling

The "Quick Wash 104" was determined to be a mixture of aromatic and aliphatic naphtha plus methylene chloride. GC/MS analysis indicated that the liquid contained approximately 4% methylene chloride and greater than 40% aromatic naphthas. No benzene or n-hexane was found.

Methylene chloride air concentrations ranged from non-detectable to 36.9 mg/m^3. Exposure levels were well below the NIOSH recommended criteria of 261 mg/m^3, see Table I.

Naphtha air concentrations were reported as total naphtha and not as aromatic or aliphatic naphtha. Air concentrations ranged from 7.3 - 229 mg/m^3 on area samples and 94 - 258 mg/m^3 for personal breathing zone samples. Since the cleaner was determined to contain greater than 40% aromatic naphtha the NIOSH criteria of 350 mg/m^3 for naphthas containing less than 20% aromatics cannot be applied. In general, the higher the aromatic content the more toxic the solvent; therefore, the applicable criteria would be more stringent than the 350 mg/m^3 level. As a guide, one of the specific aromatic naphthas identified by GC/MS in the air samples was tri-methyl benzene, which has a criteria of 125 mg/m^3 by the American Conference of Governmental Industrial Hygienists (ACGIH). While it is not correct to apply this criteria directly to these exposures, it does serve to indicate that the exposures during the operation and cleaning of the offset printer are potentially harmful, especially if conducted for extended periods.

C. Interviews

One worker who currently operates the printer and two who previously operated the printer were interviewed via a non-directed medical questionnaire. A consistent pattern of headaches, lightheadedness, dizziness and skin irritation when working with the "Quick Wash 104" was noted. The symptoms reported got better with a few breaths of fresh air. None of those interviewed were under a doctor's care for any illness.

VII. CONCLUSIONS

Using the solvent-based cleaner in a poorly ventilated area without protective gear constitutes a health hazard. The reported health effects were determined to be due to the solvent vapor emitted during the cleaning of the offset printer. Extended periods of use under the poor ventilation conditions observed could cause serious health problems.

VIII. RECOMMENDATIONS

1. Employees should be trained to be aware of the potential hazards associated with the chemicals they use. This information can be obtained from product labels or from safety data sheets supplied by the manufacturers.

2. All solvent containing materials, such as the "Quick Wash 104", should be stored in closed containers and labeled to prevent misuse and to minimize workroom contamination. Solvent rags should be disposed of in an approved closed container (check with local fire authorities).

3. Engineering controls in the form of exhaust ventilation should be used to remove the solvent vapors from the offset printer room. Relocation of the printer to a well ventilated area (with local exhaust) is another option. Continued use of the printer without ventilation is not recommended.

4. Since solvents can be absorbed through the skin and also cause dermatitis, protective clothing such as impervious gloves and aprons should be worn.

5. Half-mask, chemical respirators with organic vapor cartridges should be used during actual cleaning operations.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be

available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Arts Consortium
2. NIOSH, Region V
3. OSHA, Region V

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

TABLE I

Charcoal Tube Sample Results

Arts Consortium
Cincinnati, Ohio
HETA 82-008

November 1981

Location/Description	Sample Time	Sample Volume (Liters)	Concentrations (mg/m^3) Methylene Chloride	Concentrations (mg/m^3) Total Naphtha
Backwall, 5' from printer	10:40-2:10	10.4	8.7	141.0
Entry to printing area	10:50-12:12	4.4	15.9	229.5
Entry to printing area	12:12-2:03	5.5	N.D.	7.3
Employee operating printer	10:47-11:04	17.0	8.2	101.1
Employee operating printer	11:05-11:20	15.0	18.0	128.7
Employee operating/cleaning printer	11:25-12:10	45.0	36.9	258.4
Employee left printing area for approx. 10 minutes	12:10-12:25	15.0	2.7	94.0
Employee operating printer	10:40-2:08	20.9	12.9	120.0
NIOSH Criteria			261	*

* Since the solvent had an aromatic content of greater than 40% there is no current criteria that can be applied.

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