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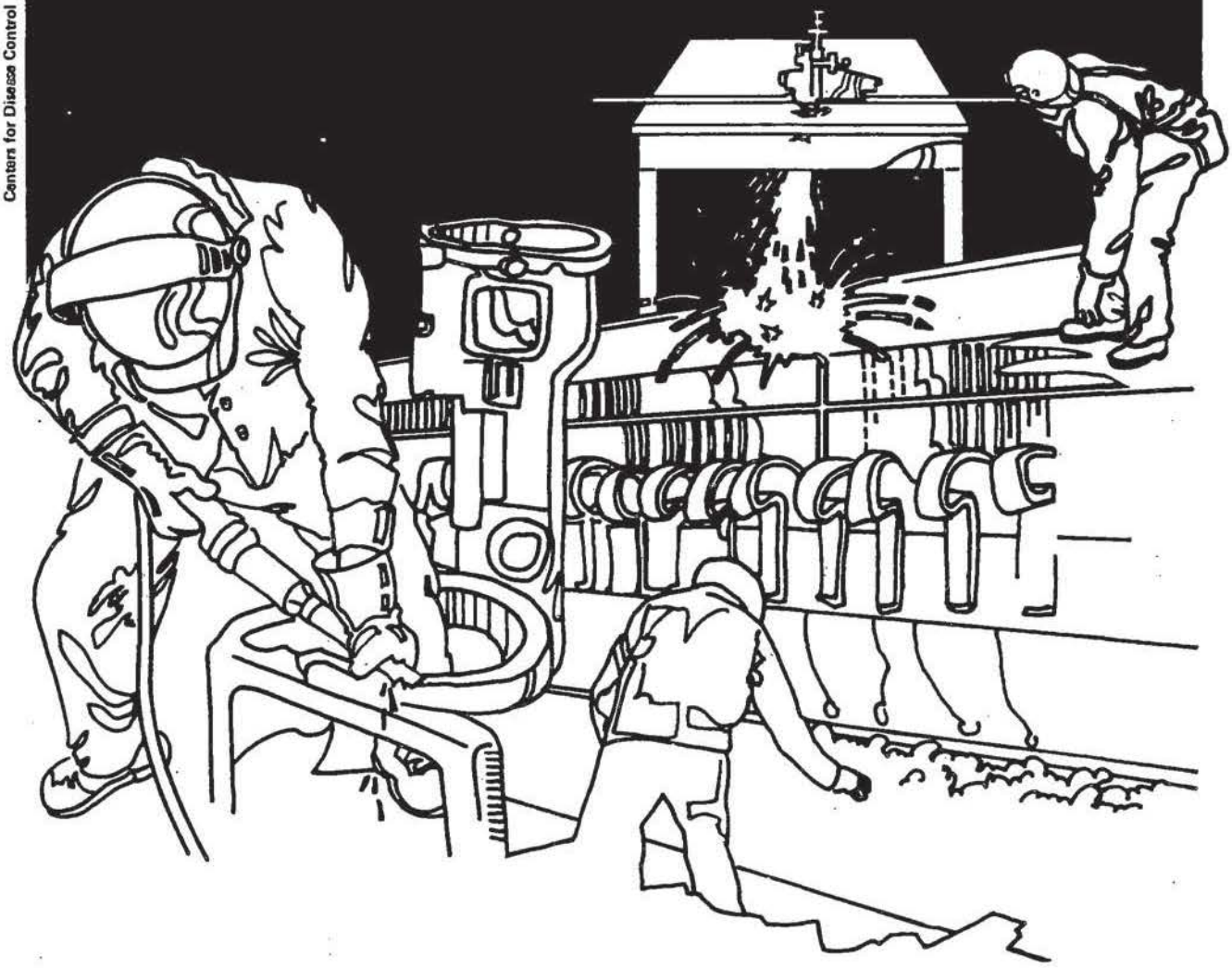

Health Hazard Evaluation Report

HETA 82-143-1165
ROCKY MOUNTAIN NEWS
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 82-143-1165
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I. SUMMARY

In February 1982, the National Institute for Occupational Safety and Health (NIOSH) received a union request to evaluate a potential health hazard from exposures to Polymer (Y) used in the platemaking department at Rocky Mountain News, Denver, Colorado.

On June 22, 1982, NIOSH conducted an environmental evaluation. Ten breathing zone air samples for measurement of methyl methacrylate, six general room air samples for measurement of methylene bisphenyl isocyanate (MDI) and toluene-2,4-diisocyanate (TDI), and six general room air samples for measurement of phenol were collected in the platemaking department. All concentrations were below the detection limits of 0.01 milligrams per sample (mg/sample) for methyl methacrylate, 0.001 mg/sample for MDI, 0.002 mg/sample for TDI, and 0.02 mg/sample for phenol.

There were approximately 15 workers in the platemaking department who worked in the vicinity where Polymer (Y) was used. All of these workers were interviewed; two had symptoms which could be attributed to methyl methacrylate exposures, namely dermatitis and hives.

On the basis of the environmental data and employee interviews, NIOSH concluded that a health hazard did not exist from exposure to Polymer (Y) at the time of this survey. Recommendations for improving the workplace environment are included in this report.

KEYWORDS: SIC 2711 (Newspapers: Publishing, Publishing and Printing), methylene bisphenyl isocyanate (MDI), methyl methacrylate, phenol, toluene-2,4-diisocyanate (TDI), newspaper publishing.

II. INTRODUCTION

In February 1982, the National Institute for Occupational Safety and Health (NIOSH) received a union request to evaluate a potential health hazard from exposures to Polymer (Y) used in the platemaking department at Rocky Mountain News, Denver, Colorado.

On June 22, 1982, NIOSH conducted an environmental evaluation. Results of the environmental sampling were sent to the requestor and management on July 19, 1982.

III. BACKGROUND

Polymer (Y) is used to make plates for each page of newspaper print. In the platemaking department at Rocky Mountain News there are three letter flex machines. Polymer (Y) is used in each one of these three systems to properly develop and form the plates. During the formation of the plates and the use of Polymer (Y), there is a faint odor of methyl methacrylate. The only toxic ingredients of Polymer Y were isocyanate, methyl methacrylate, and phenol.

IV. ENVIRONMENTAL DESIGN AND METHODS

Six general room air samples were collected for measurement of phenol in impingers using vacuum pumps operated at one liter per minute and analyzed according to NIOSH Method No. S-330.

Six general room air samples for measurement of methylene bisphenyl isocyanate (MDI) and toluene-2,4-diisocyanate (TDI) were collected using impingers filled with Marcali solution using vacuum pumps operated at one liter per minute and analyzed according to NIOSH P&CAM Method Nos. 141 and 142.

Ten breathing zone air samples for measurement of methyl methacrylate were collected on porous aromatic polymer sampling tubes using vacuum pumps operated at 50 centimeters per minute and analyzed according to NIOSH Method No. S-43.

Most of the workers were interviewed. The major complaint was due to the lack of comfort ventilation.

V. EVALUATION CRITERIA

A. Environmental

Three sources of criteria used to assess the workroom concentrations of the chemicals were (1) recommended Threshold Limit Values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1981, (2) the NIOSH criteria for a recommended standards, and (3) the Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), July 1980.

	Environmental Limits 8-Hour Time-Weighted Exposure Basis
Methylene bisphenyl isocyanate (MDI)...	0.02 ppm (OSHA) (ACGIH)
Methyl methacrylate.....	100 ppm (OSHA) (ACGIH)
Phenol.....	5 ppm (NIOSH) (ACGIH) (OSHA)
Toluene-2,4-diisocyanate (TDI).....	0.005 ppm (NIOSH) 0.04 ppm (ACGIH) 0.02 ppm (OSHA)

ppm = parts per million

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

B. Toxicological

Methylene Bisphenyl Isocyanate (MDI) in sufficient amounts is a primary irritant of the mucous membranes of the eyes, nose, and throat, and of the respiratory tract.[1] In addition, it may cause allergic sensitization of the respiratory tract which may result in severe asthmatic attacks after exposure to even minute traces of MDI. Fully reacted MDI no longer elicits an allergic or irritant response.

Methyl Methacrylate[2] is a colorless liquid used almost exclusively in the manufacturing of methacrylate resins and plastics. This compound is irritating to the eyes, mucous membranes, and skin. Human exposures to concentrations of 800 to 1600 mg/M^3 has caused irritation to eyes and nose. Dermatitis has occurred from skin contact with the liquid. The OSHA Standard and the current Threshold Limit Value (TLV) were set to prevent irritation.

Phenol[3] may be toxic either by inhalation, ingestion, or percutaneous. Excessive exposures to phenol may produce cellular necrosis, cerebral edema, damage to the liver and kidney and pulmonary edema. The central nervous system (CNS) is first stimulated then depressed. Acute signs and symptoms of exposure include conjunctival burns, corneal necrosis, and severe skin burns. The effect of ingestion include burns of mouth, pharynx, gastrointestinal tract, perforation of intestinal tract, nausea, vomiting, abdominal pain, and jaundice. Acute symptoms of inhalation include dyspnea, cough, cyanosis, and pulmonary edema.

Workers that are chronically exposed to phenol should receive annual physicals including liver and kidney function. Individuals with serious disease of the CNS, liver, kidney, and lung should be precluded from exposure. Maintaining a worker's exposure below a time weighted average (TWA) of 5 ppm should be adequate protection.

Toluene-2,4-diisocyanate (TDI) -- Present knowledge regarding diisocyanate toxicity has largely been achieved as a result of investigations into the effects of its most widely used derivative, toluene diisocyanate (TDI). Liquid at room temperature, this highly volatile substance possesses a vapor pressure of 0.04 mm at 20°C. Its pungent, acrid odor is detectable at concentrations of 0.005 ppm.[4] At levels of 0.5 ppm, exposed workers complain of itchy eyes, nasal congestion, and a dry, sore throat.[4] At higher concentrations, breathlessness, chest tightness, wheezing, and cough may occur.[5,6] High exposures may lead to pulmonary edema.[7] As a rule, skin involvement is usually absent;[4] however, with prolonged contact, redness, swelling, and blistering have been noted.[8] Less common symptoms resulting from TDI exposure include nausea, vomiting, abdominal pain, and occasionally a throbbing headache.[4,8] In addition to the irritating effects of TDI, approximately 5 percent of exposed workers develop signs of respiratory sensitization.[9] The range of onset of sensitization from initial exposure varies from 6 months to 23 years with a mean of about 3 years.[10] Once sensitization has occurred, exposure to concentrations of TDI as low as 0.0018 ppm can provoke asthma-like symptoms including shortness of breath, wheezing, dyspnea, and cough.[6] These reactions may occur within minutes or hours of exposure, and occasionally a dual reaction is noted with both an immediate and a late (delayed) response. The nature of this sensitization is still unclear; however, pharmacological rather than allergic mechanisms may be involved.[11]

VI. RESULTS

On June 22, 1982, ten breathing zone air samples for measurement of methyl methacrylate, six general room air samples for measurement of methylene bisphenyl isocyanate (MDI) and toluene-2,4-diisocyanate (TDI), and six general room air samples for measurement of phenol were collected in the platemaking department. All concentrations were below the detection limits of 0.01 milligrams per sample (mg/sample) for methyl methacrylate, 0.001 mg/sample for MDI, 0.002 mg/sample for TDI, and 0.02 mg/sample for phenol.

There were approximately 15 workers in the platemaking department who worked in the vicinity where Polymer (Y) was used. All of these workers were interviewed; two had symptoms which could be attributed to methyl methacrylate and other chemical exposures. The small number of additional complaints consisted of tiredness, excessive sweating, and lightheadedness.

VII. DISCUSSIONS AND CONCLUSIONS

Based on the environmental sampling and employee interviews, a hazardous situation did not exist during this evaluation from exposure to Polymer (Y).

On the night of this survey the workplace environment was relatively clean and had few odors. It should be stressed that methyl methacrylate even in small quantities has a very offensive odor.

It was apparent that this workplace may get extremely hot and uncomfortable. Therefore, additional comfort ventilation is recommended.

VIII. RECOMMENDATIONS

1. Workers should not be permitted to smoke around the letter flex machines.

2. Additional comfort ventilation should be installed.

IX. REFERENCES

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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. Rocky Mountain News.
2. Graphics Arts International Union, Local 576.
3. Graphics Arts International Union.
4. U.S. Department of Labor/OSHA - Region VIII.
5. NIOSH - Region VIII.
6. Colorado Department of Health.
7. State Designated Agency.

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 1

Breathing Zone Air Concentrations of Methyl Methacrylate
in the Platemaking Department

Rocky Mountain News
Denver, Colorado

June 22, 1982

Sample Number	Job Classification	Sampling Time	ppm Methyl Methacrylate
01	Newspaper	6:50 PM - 11:44 PM	*
02	Newspaper	6:50 PM - 11:52 PM	*
03	Offset	6:50 PM - 11:48 PM	*
04	Veelox	6:50 PM - 11:58 PM	*
05	Letter Flex (1)	6:51 PM - 11:50 PM	*
06	Coating Plates	7:00 PM - 12:02 PM	*
07	Letter Flex (2)	6:56 PM - 11:41 PM	*
08	Punch Operator	6:58 PM - 11:55 PM	*
09	Strip Foreman	6:53 PM - 11:46 PM	*
10	Foreman	6:55 PM - 11:55 PM	*
EVALUATION CRITERIA			100
LABORATORY LIMIT OF DETECTION mg/sample			0.01

* = below laboratory limit of detection

TABLE 2

General Room Air Concentrations of
Methylene Bisphenyl Isocyanate (MDI), Toluene-2,4-Diisocyanate (TDI)
in the Platemaking Department

Rocky Mountain News
Denver, Colorado

June 22, 1982

Sample Number	Location	Sampling Time	ppm MDI	ppm TDI
11	Top Reservoir Letter Flex Machine	7:07 PM - 11:05 PM	*	*
22	Top of Post Exposure	7:10 PM - 11:08 PM	*	*
33	Air Knife	7:14 PM - 11:05 PM	*	*
55	Top of Exposed Section	7:15 PM - 11:00 PM	*	*
66	Lithoplater	7:22 PM - 11:20 PM	*	*
77	Veelox Area	7:27 PM - 11:35 PM	*	*
EVALUATION CRITERIA			0.02	0.005
LABORATORY LIMIT OF DETECTION mg/sample			0.001	0.002

* = below laboratory limit of detection

TABLE 3

General Room Air Concentrations of Phenol
in the Platemaking Department

Rocky Mountain News
Denver, Colorado

June 22, 1982

Sample Number	Location	Sampling Time	ppm Phenol
110	Veelox Area	7:30 PM - 11:35 PM	*
111	Letter Flex Machine	7:40 PM - 10:00 PM	*
112	Air Knife	7:41 PM - 11:07 PM	*
113	Top of Post Exposure	7:43 PM - 11:08 PM	*
114	Lithoplater	7:48 PM - 11:20 PM	*
115	Lithoplater	7:50 PM - 11:35 PM	*
EVALUATION CRITERIA			5.0 (1)
LABORATORY LIMIT OF DETECTION mg/sample			0.02

* = below laboratory limit of detection

(1) = skin notation on 1981 ACGIH Threshold Limit Value

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