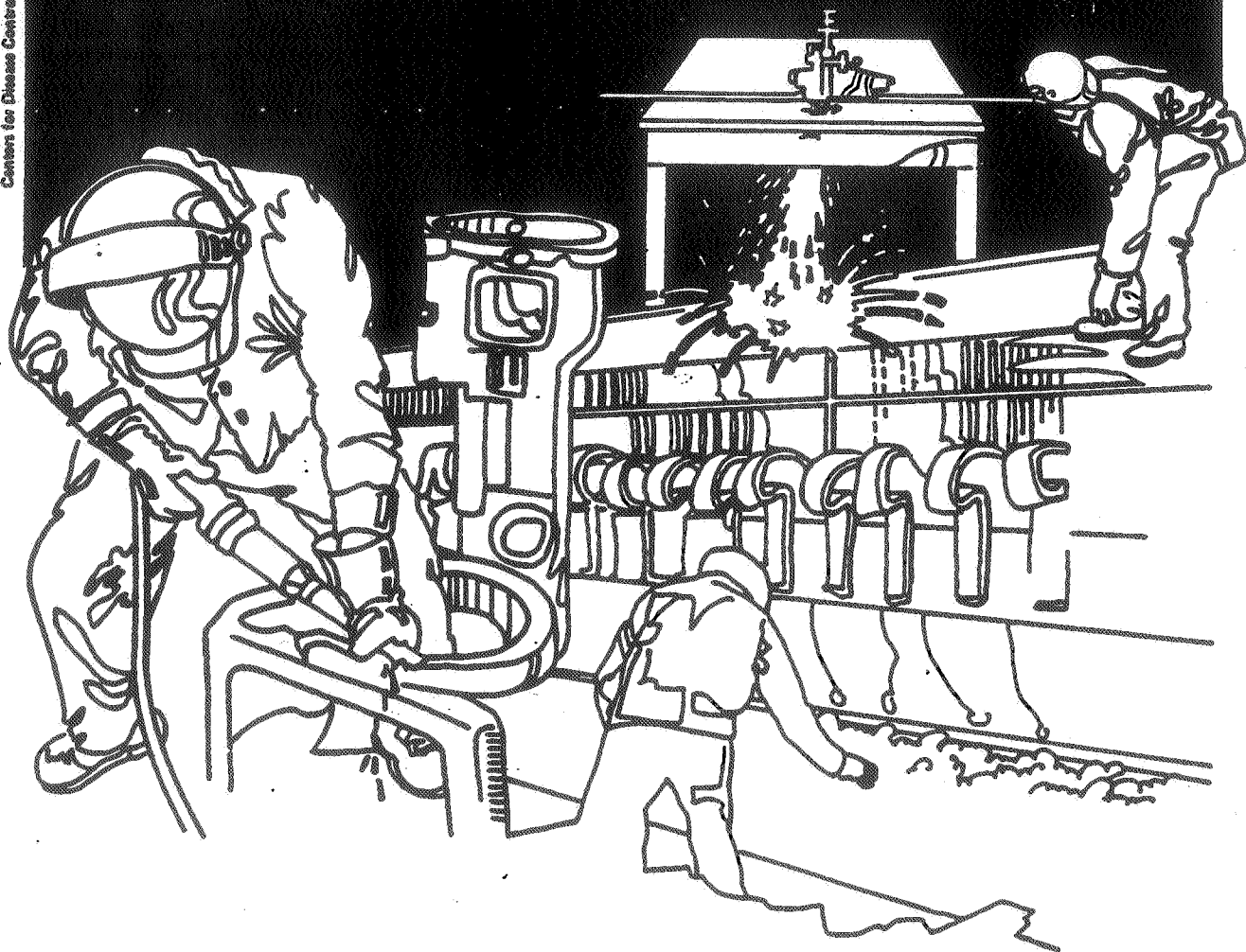


NIOSH



Health Hazard Evaluation Report

HETA 85-433-1638
CURRENT, INC.
COLORADO SPRINGS, 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.

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

HETA 85-433-1638
DECEMBER 1985
CURRENT, INC.
COLORADO SPRINGS, COLORADO

NIOSH INVESTIGATOR
Bobby J. Gunter, Ph.D.

I. SUMMARY

In July, 1985, the National Institute for Occupational Safety and Health (NIOSH), received a request from Current, Incorporated, Colorado Springs, Colorado for technical assistance in evaluating solvent exposures in all areas of their two facilities.

An environmental survey was performed on August 13 - 14, 1985. Breathing zone and general room air samples were taken in both buildings. Most of the samples were taken in the area around the printing presses and plate making operations. Thirty air samples were taken for toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, isopropanol, and nuisance dust.

Exposure levels for toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, and isopropanol ranged from below the laboratory limit of detection of 0.01 mg/sample for each of the above to a high of 8 mg/M³ for toluene (average of 1.4 mg/M³), 9 mg/M³ for xylene (average of 1.7 mg/M³), 5 mg/M³ for ethyl benzene (average of 0.4 mg/M³), 344 mg/M³ for methylene chloride (average of 28 mg/M³), 4 mg/M³ for perchloroethylene (average of 0.4 mg/M³), and 83 mg/M³ for isopropanol (average of 30 mg/M³). All of these concentrations are far below the evaluation criteria except for methylene chloride, which had a maximum concentration of 344 mg/M³. Animal experimentation data suggest that methylene chloride and perchloroethylene may have carcinogenic potential and these exposure levels should be reduced.

Workers were interviewed and the only consistent complaints were narcosis, eye irritation, and occasional nausea.

On the basis of the data obtained during this investigation, it was determined that a potential health hazard did exist from exposures to methylene chloride. This is based on its potential as a carcinogen and the one general room air sample that exceeded the evaluation criteria. Recommendations of solvent substitutions and ventilation are provided in this report.

Keywords: (SIC 2770) Greeting card publishing, toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, and isopropanol, and nuisance dust.

II. INTRODUCTION

In July, 1985, NIOSH received a request from the safety and health department of Current, Inc., Colorado Springs, Colorado. The purpose of this request was to do a general evaluation of the chemical exposures in their two plants. A walk-thru survey was conducted in July with a follow-up industrial hygiene survey performed on August 13 - 14, 1985.

III. BACKGROUND

Current, Inc., operates at two locations in Colorado Springs. The stone facility occupies 133,000 square feet and houses the printing presses. Current prints, assembles, and sells directly by mail, a large variety of stationery products.

The other facility does most of the packaging and mailing. The pressroom and platemaking areas employ approximately 40 and 4 hourly employees respectively. The number of employees varies since this work is very seasonal. However, during this survey about 250 employees were working in areas of the plant that were evaluated. The environmental survey was mainly restricted to the pressrooms since other areas did not use chemicals in amounts that could possibly cause overexposures. NIOSH had previously conducted a survey at this plant in 1980 (HHE 80-018). No overexposures were found during that evaluation.

IV. Evaluation Design and Methods

Twenty-nine breathing zone and one general room air samples were collected in the printing press areas. These samples were collected on organic vapor charcoal sampling tubes and analyzed according to NIOSH methods 1400, 1501, and 1005 with modifications. A total of six solvents namely; toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, and isopropanol were analyzed on each tube. This accounted for 180 analyses. Four nuisance dust samples were collected on preweighted filters and analyzed by weight difference.

V. EVALUATION CRITERIA

- A. 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 solely 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 Criteria

Substances evaluated in this study are shown below

Environmental Exposure Limits
8-Hour Time-Weighted Average (TWA) Mg/M³

	<u>NIOSH</u>	<u>OSHA</u>	<u>ACGIH</u>
Toluene	375	750	375
Xylene	435	435	435
Ethyl Benzene	435	435	435
Methylene Chloride	260*	1700	350
Perchloroethylene	*	670	335
Isopropyl Alcohol	980	980	980
Nuisance Dust	-	15	10

* NIOSH considers these to be suspect carcinogens so exposures should be lowered to the lowest possible level.

mg/M³ - Milligrams of substance per cubic meter of air.

B. Toxic Effects

Toluene - Toluene can affect the body by all three routes of entry. Acute exposure may cause irritation to the eyes, respiratory tract and skin. It may cause fatigue, weakness, confusion, headache, dizziness, and drowsiness. Chronic exposure may cause defatting dermatitis. Reversible liver and kidney damage can occur in overexposed workers. Hippuric Acid in urine is an index of worker exposure to toluene.¹

Xylene - Xylene can be toxic by all routes of entry. It is irritating to the eyes and mucous membranes. Narcosis is produced at levels below the evaluation criteria of 435 mg/M³.²

Ethyl Benzene - Exposures to ethyl benzene may cause skin and mucous membrane irritation. Excessive exposures produce narcosis and the anesthetic effect. Defatting dermatitis may occur with repeated exposure.²

Methylene Chloride - Methylene Chloride is an irritant; it depresses the central nervous system and can elevate carboxyhemoglobin levels. The signs and symptoms of exposure include: irritation of eyes and respiratory tract, headache, dizziness, nausea and vomiting.³ Recently, the National Toxicology Program has reported that methylene chloride showed "clear evidence of carcinogenicity" in a laboratory test using mice.⁴ On the basis of these results and other recent literature, NIOSH is currently reevaluating its recommendations on Methylene Chloride.

Perchloroethylene - Perchloroethylene is a widely used solvent with particular use as a dry cleaning agent, a degreaser, and a chemical fumigant. Repeated contact may cause a dry, scaly and fissured dermatitis. High exposures may produce eye and nose irritation. Acute exposures may cause CNS depression and liver damage. Overexposure may cause dizziness, headaches, increased perspiration, fatigue and slowing of mental ability. Because perchloroethylene is eliminated from the body more slowly than most solvents, there is a tendency for the body burden to gradually increase over the work week. Medical surveillance should include skin examination and liver and kidney function.^{5, 6} The National Institute for Occupational Safety and Health (NIOSH) Current Intelligence Bulletin #20 states that perchloroethylene should be treated as a carcinogen due to its ability to cause cancer in experimental animals.⁷

Isopropyl Alcohol - Isopropyl Alcohol (rubbing alcohol) is not very toxic and can be smelled at one half the evaluation criteria. Repeated exposure may cause dermatitis and mild eye and mucous membrane irritation.

Nuisance Dust - Nuisance Dust in excess of the evaluation criteria may cause numerous complaints such as eye, nose, throat irritation. These symptoms may occur at levels less than the evaluation criteria of 10 mg/M³.

VI. Results and Discussion

On August 13, and 14, 1985, an environmental investigation was performed at Current, Inc., Colorado Springs, Colorado. Environmental samples were collected for toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, and isopropyl alcohol. Only one sample for methylene chloride exceeded the current recommended exposure limit. Recent information about the carcinogenic potential of methylene chloride indicates that exposures should be reduced to the lowest feasible level. All other solvents were well within the evaluation criteria; these results may be reviewed in Table 1 and 2. A summary of the environmental data is given below.

Exposure levels for toluene, xylene, ethyl benzene, methylene chloride, perchloroethylene, and isopropyl alcohol ranged from below the laboratory limit of detection of 0.01 mg/sample for all the above to a high of 8 mg/M³ for toluene (average of 1.4 mg/M³), 9 mg/M³ for xylene (average of 1.7 mg/M³), 5 mg/M³ for ethylene benzene (average of 0.4 mg/M³), 344 for methylene chloride (average of 28 mg/M³), 4 mg/M³ for isopropyl alcohol (average of 30 mg/M³). All of these sample results, except for methylene chloride, were below the evaluation criteria. NIOSH further recommends that methylene chloride and perchloroethylene be reduced to the lowest possible level. About half the workers were informally interviewed. Complaints were not sufficient to warrant a medical evaluation.

VII. CONCLUSIONS

The environmental survey indicated that potential overexposures to methylene chloride may occur. It would be advisable to either substitute another solvent or add additional local ventilation to eliminate exposure to methylene chloride.

This facility was extremely clean and well maintained. Employee interviews indicated that workers were pleased with their jobs and complaints were limited.

VIII. Recommendations

1. The substitution of less toxic solvents is recommended for methylene chloride and perchloroethylene, if this is possible.
2. Local exhaust ventilation should be installed next to all printing presses.
3. Smoking and eating should be prohibited in the pressroom.

IX. REFERENCES

1. NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards Jan. 1981.

2. Chemical Hazards of the workplace, N.H. Proctor, J.P. Hughes 1978.
3. Occupational Health Guidelines for Chemical Hazards, Department of Health and Human Services Publication (NIOSH) No. 81-123, January 1981.
4. NTP Technical Report Series Report No. 306. NTP Report No. 85-024. HHS (NIH) Publication No. 85-1562m, 1985.
5. Occupational Diseases: A Guide to Their Recognition, Department of Health, Education and Welfare (NIOSH) Publication No. 77-181, Revised Edition, June 1977.
6. NIOSH Criteria for a Recommended Standard: Occupational Exposure to Tetrachloroethylene (Perchloroethylene). DHEW Publication No. (NIOSH) 77-121, 1977.
7. NIOSH Current Intelligence Bulletin #20 -- Tetrachloroethylene (Perchloroethylene). DHHS (NIOSH) Publication No. 78-112, 1978.

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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. Current, Inc.
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 1

Breathing Zone and General Air Room Concentrations of
Toluene, Xylene, Ethyl Benzene, Methylene Chloride,
Perchloroethylene, and Isopropanol at
Current, Inc.,
Colorado Springs, Colorado
August 13 - 14, 1985

Sample #	BZ	GA	Location	Sample Time	Concentration (Mg/M ³)					
					TOL	XYL	EB	MC	PERC	IS
1	BZ		49-2	4:45p - 9:52p	0.7	0.9	*	16	*	56
2	BZ		49-2	4:47p - 9:43p	*	0.9	*	15	0.9	31
3	BZ		802	4:48p - 9:43p	1	2	0.4	33	0.4	46
4	BZ		802	4:49p - 9:43p	0.8	2	0.5	28	*	50
5	BZ		804	4:50p - 9:42p	0.8	1	0.3	18	*	49
6	BZ		806	4:50p - 9:40p	*	*	*	*	*	*
7	BZ		49-1	4:51p - 9:43p	1	2	0.6	22	0.6	88
8	BZ		806	4:52p - 9:40p	*	0.6	*	8	*	29
9	BZ		804	4:53p - 9:52p	1	2	5	37	*	63
10	BZ		49-1	4:53p - 8:30p	*	1	*	20	*	83
11	BZ		MTL's Hnd	4:55p - 9:40p	0.8	1	0.3	8	*	14
12	BZ		Dept. 31	8:55a - 1:10p	*	*	*	*	*	*
13	BZ		Art Dept.	8:33a -12:32p	*	*	*	*	0.6	*
14	BZ		Adv. Dept.	8:24a -12:24p	*	*	*	*	0.7	*
15	BZ		804	6:11a - 9:25p	1	3	0.7	*	*	31
16	BZ		804	6:12a - 9:30p	1	1	*	17	*	43
17	BZ		Mac. Shop	6:47a -10:14p	4	1	*	11	4	43
18	BZ		806	6:18a -10:03p	0.6	1	*	1	*	2
19	BZ		806	6:20a -10:00p	1	1	*	21	*	35
20	BZ		Plt. Mkg.	6:43a - 9:53p	4	0.6	*	4	*	1
21	BZ		49-2	6:16a - 9:48p	3	2	*	28	*	53
22	BZ		Env. Dept.	6:00a -10:04p	0.3	*	*	2	*	18
23	BZ		804	9:27p - 1:55p	2	4	0.8	13	0.3	35
24	BZ		804	9:32p - 2:03p	8	7	1.4	18	4	17
25	BZ		49-2	9:50p - 2:00p	2	4	1	96	*	61
26	BZ		Plt. Mkg.	9:54p - 2:55p	1	*	*	1.5	*	7
27	BZ		806	10:02p- 2:50p	1	2	*	29	*	12
28	BZ		806	10:05p- 2:45p	3	1	*	26	1	12
29	BZ		Env.	10:06p- 2:00p	*	*	*	*	*	*
30	GA		806	10:17p- 2:50p	6	9	2	344	*	20
Evaluation Criteria					375	435	435	260A	A	980
Laboratory Limit of Detection mg/sample					0.01	0.01	0.01	0.01	0.01	0.01

A = NIOSH considers these to be suspect carcinogens and should be lowered to the lowest possible level.

* = None Detected

TOL = Toluene

XYL = Xylene

EB = Ethyl Benzene

MC = Methylene Chloride

PERC= Perchloroethylene

IS = Isopropanol

Table 2

General Room Air Concentrations of the Nuisance Dust
in the Printing Press Area at
Current, Inc.,
Colorado Springs, Colorado
August 13 - 14, 1985

<u>Sample #</u>	<u>Location</u>	<u>Sampling Time</u>	<u>mg/M³</u>
9013	Press 806	5:00a - 10:00a	0.05
9021	Press 29-2	5:00a - 10:00a	1.20
9019	Press 804	6:25a - 2:44p	0.05
9032	Press 806	6:25a - 2:55p	0.02
Evaluation Criteria			10
Laboratory Limit of Detection		0.01 mg	