U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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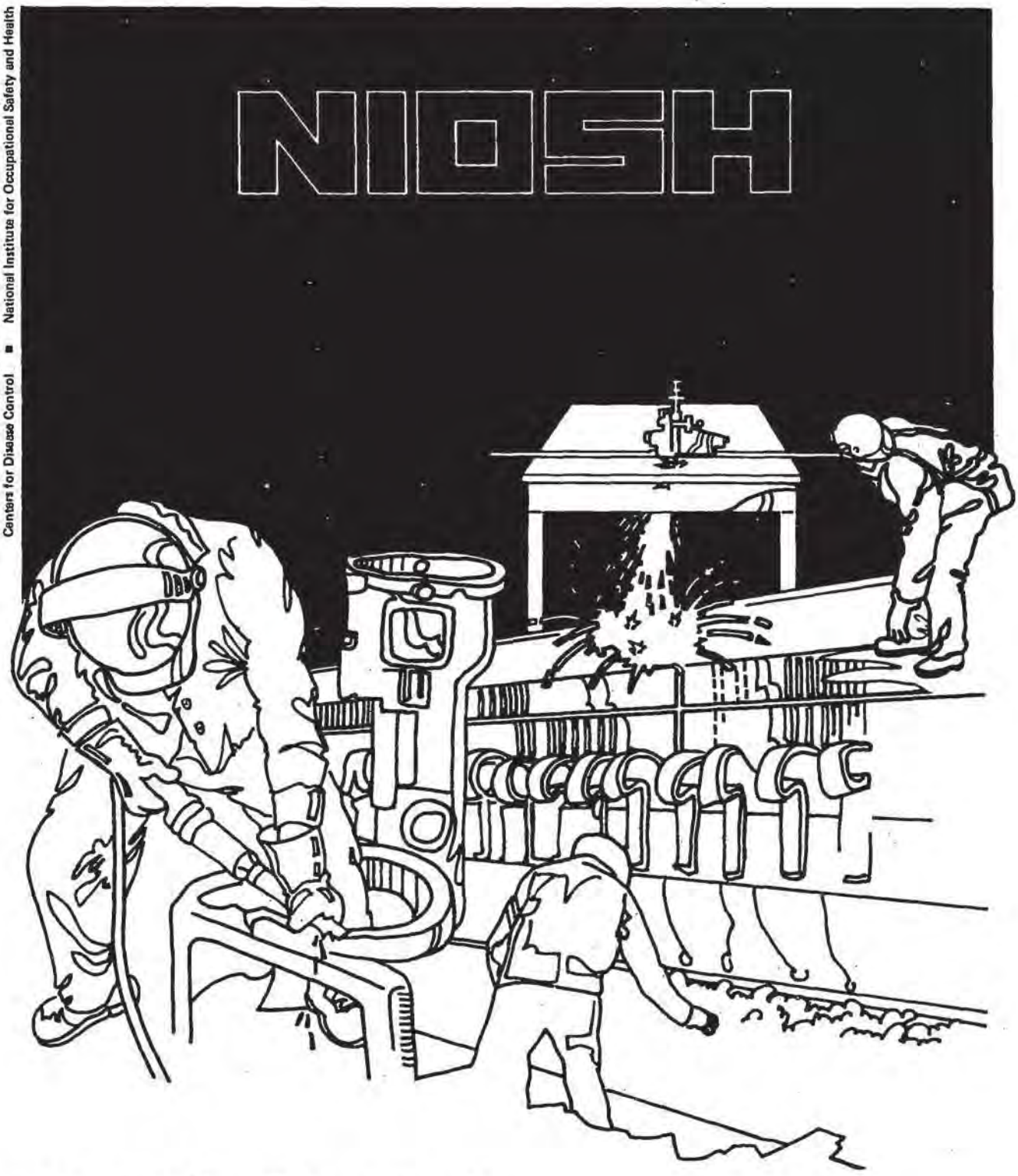
NIOSH



Health Hazard Evaluation Report

HETA 83-014-1343
NORTH CLACKAMAS SCHOOL
DISTRICT NO. 12
MILWAUKIE, OREGON

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 83-014-1343
JULY 1983
NORTH CLACKAMAS SCHOOL DISTRICT NO. 12
MILWAUKIE, OREGON

NIOSH INVESTIGATORS:
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I. SUMMARY

In October 1982, the National Institute for Occupational Safety and Health (NIOSH) received a request to determine if symptoms of headache, fatigue and mood changes experienced by the three workers in the phototypesetting room at the North Clackamas School District # 12, Milwaukie, Oregon were a result of occupational exposures.

On January 13, 1983, the employees were interviewed by a NIOSH physician. On February 15 and 16, environmental air samples were collected to determine workers' exposures to the pototypesetting chemicals. In addition, temperature, relative humidity, and carbon dioxide concentrations were monitored.

The following 8-hour time weighted averages were measured: acetic acid - 0.3 to 0.6 ppm; ammonia - less than 0.1 ppm; stoddard solvent - 1 ppm and less than 0.1 ppm; 1,1,1 trichloroethane - 0.1 ppm and less than 0.1 ppm. These concentrations are all less than 6% of the evaluation criteria used in the evaluation. The temperature ranged from 71° to 72° F at the beginning of the shift to 75.5° and 77° F in the afternoon. The relative humidity ranged from 36 to 41% and the carbon dioxide concentrations from 400 ppm at the beginning of the shift to a high of 650 ppm. Carbon dioxide occurs naturally in concentrations from 300 to 500 ppm.

The workers reported that their headaches were temporally related to the times spent in the phototypesetting room. They also experienced a tired feeling and mood changes in the afternoon, difficulty concentrating on their work, runny noses and frequent clearing of the throat. One worker was moved to a different work area, and since the move her symptoms have not recurred.

On the basis of this investigation NIOSH determined that the adverse health effects experienced by the workers in the phototypesetting could be a result of the following conditions: (1) a lack of any air being supplied to the room resulting in an increase of temperature and carbon dioxide levels; (2) low concentrations of acetic acid vapors; (3) glare on the VDT screen; (4) nonadjustable viewing angle of the screen. Recommendations to improve and/or eliminate these conditions are included in this report.

KEYWORDS: SIC 2971 (Typesetting) phototypesetting, acetic acid, ammonia, carbon dioxide, temperature.

II. INTRODUCTION

In October 1982 NIOSH received a request from the employees at the North Clackamas School District No. 12 to determine if the adverse health effects (i.e., headaches, fatigue, mood changes) experienced by the three workers in the phototypesetting room were a result of the work environment. An initial environmental/medical survey was made on January 13, 1983, and environmental sampling was conducted on February 15 1nd 16, 1983. An interium report was sent on January 21, 1983.

III. BACKGROUND

The North Clackamas School District operates a print shop for the entire school district. The phototypesetting process is one operation of the printing shop.

The phototypesetting room is approximately 11 x 21 feet and 12 feet high and contains two doors and no windows. It is in the center of a large building next to the print shop. (Other activities in the building include a wood shop, foundry, metal shop, and auto repair.) The room has no provision for fresh air due to the absence of windows and of a mechanical ventilation system. Heat is provided by a ceiling hung space heater. There is no provision for cooling the air. A small wall fan is located next to the door in one corner near the ceiling and terminates in the adjacent hallway near the door to the room.

The room contains two video display terminals which are a part of the phototypesetter, the photo processor, two light tables and a counter. The chemicals used on a daily basis in the photo processor include an activator which contains potassium hydroxide, a deactivator which contains acetic acid, and ammonium thiocyanate. Acetic acid is released during the photoprocessing and from the processed paper that is laid on the counter to dry. Ammonia can be released if the two products are mixed. A spray adhesive that contains 1,1,1 trichloroethane and stoddard solvent is occasionally used in small quantities.

There were three workers who were assigned to this room. Two were phototypesetters and the third a graphics artist. Following the initial visit, the graphics artist was moved to another building.

The following conditions were observed during this visit: 1-Acetic acid vapors were noticeable; 2-The room was warm and stuffy; and 3-There was a glare on the VDT screen.

IV. EVALUATION DESIGN AND METHODS

General area air samples were collected for acetic acid, ammonia, stoddard solvent, and 1,1,1 trichlorethane. Carbon dioxide temperature and relative humidity measurements were made throughout the day.

Listed below are the sampling and analytical methods used in this evaluation:

Substance	Collection Method	Flow Rate	NIOSH Analytical[1] Method
acetic acid	charcoal tube	1 lpm min	P&CAM S-169
ammonia	long term detector tube	20cc/min	direct reading
carbon dioxide	detector tube	-	direct reading
stoddard solvent	charcoal tube	50cc/min	P&CAM 127
1,1,1 tri-chloroethane	charcoal tube	50cc/min	P&CAM 127

The medical evaluation consisted of individual interviews with the three workers by the NIOSH physician during which time past and present health effects were elicited.

V. EVALUATION CRITERIA

A. Environmental Criteria

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).

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), 3- the U.S. Department of Labor (OSHA) Occupational Health Standard and 4-the Oregon State Standards.

Environmental criteria for substances evaluated during the evaluation are shown below.

Substance	NIOSH (or ACGIH) Recommended Criteria 10 Hr TWA	Oregon State Standard 8 Hr TWA	Health Effects
acetic acid	10 ppm (ACGIH)	10 ppm	irritates nose, throat; burns eyes, skin; tearing of the eyes; chronic bronchitis
ammonia	50 ppm 5 min ceiling (NIOSH)	25 ppm	irritation of eyes, respiratory tract and skin
carbon dioxide	10,000 ppm (NIOSH)	5,000 ppm	high concentrations (80,000+) may produce headache, dizziness, nausea, vomiting & unconsciousness
stoddard solvent	350 mg/cu m	200 ppm	irritation of eyes, nose, throat. dizziness, headache
1,1,1 trichloroethane	350 ppm 15 min ceiling (NIOSH)	350 ppm	irritation of eyes, headache, central nervous system depressant, dermatitis

*TWA - Time Weighted Average

VI. RESULTS AND DISCUSSION

A. Environmental

The environmental results are shown in Tables 1 and 2. Acetic acid is released when the typeset papers are processed through the photoprocessor. It takes about 30 seconds to process a sheet which occurs 20 to 30 times a day. The operator's exposure to acetic acid vapors during this period is 2 - 3 ppm. The wet processed sheets are laid on the counter to dry. Waste sheets are put in an open waste paper basket. Until the sheets are dry, acetic acid is released. On the two days of sampling, the acetic acid concentration in the room were 0.3 and 0.6 ppm. The operator's 8-hour time weighted average exposure is 0.4 to 0.7 ppm. These concentrations are less than 7% of the evaluation criteria of 10 ppm for acetic acid. Acetic acid odors are detectable at the levels measured.

Ammonia was less than the detectable concentration of 0.1 ppm. The stoddard solvent and 1,1,1 trichoroethane concentrations as a result of using the spray adhesive were all 1 ppm or less which is extremely low.

Temperature, humidity and carbon dioxide concentrations were measured throughout the two days. At the start of the shift the temperatures were 72° and 71° F and rose through the day to 77° and 75.5° F. The humidity ranged from 36 to 41%. The carbon dioxide concentration at the beginning of the shifts were 400 ppm and rose to 650 ppm. Because there was no supply air into the room and the exhaust fan was near the door to the room, the buildup of heat and carbon dioxide concentrations were expected.

The phototypesetters spend most of their day using the video display terminals. The table height and screen viewing angle were not adjustable and there was a glare on the screen from the room lights.

B. Medical

The workers are females. Two are phototypesetters, and the third a graphic artist. They have worked with the NCSD from 5 to 13 years, and in their present location with the print shop for 1, 2 and 2 years. They are the only workers who have occupied the room.

All three workers reported that they have headaches beginning between 9:00am and 10:00am on almost every work day, but not on days when they do not work. The headaches persist through the work shift, dissipate somewhat between 11:30am and noon when the workers leave their room and go to another building for lunch, respond to aspirin (although the workers seldom choose to use self-medication), and go away within an hour of the time they leave work to go home. One worker reported onset of this symptom during "summer" of 1982, the other two workers report durations of two years.

All workers also describe a tired feeling (like "falling asleep") in the afternoon at work; mood changes in the afternoon; and difficulty concentrating on their work. Two workers reported runny nose" and frequently "clearing my throat" for at least two weeks preceding our visit. None had major medical conditions requiring regular physician monitoring. None took medications regularly.

After the initial visit the graphics artist was relocated to another area. Since this time her adverse health effects have not recurred.

VII. CONCLUSIONS

There are several things that occur simultaneously throughout the day that could be the cause of the adverse health effects experienced by the workers: (1) low levels of chemical exposure; (2) a lack of any air being supplied to the room, resulting in an increase of the temperature and carbon dioxide levels; (3) glare on the VDT screen; and (4) non-adjustable viewing angle of the screen. Since the one worker was moved from this room, her symptoms have not recurred. It is anticipated that making the changes listed in the recommendations will result in a reduction and/or elimination of the health effects.

VIII. RECOMMENDATIONS

1. Air must be supplied to the room by means of a mechanical ventilation system. The Clackamas County Building Department codes (Section 605 of the Uniform Building Code) require a minimum of 5 cfm/person of fresh outside air and a minimum total air volume of 15 cfm/person be supplied to a room such as this.

2. A local exhaust ventilation system should be installed on the photoprocessor and the air should be exhausted directly to the outside. The contaminants exhausted by the existing wall fan into the hallway can reenter the room through the door thus contaminating both the hallway and the room.

3. spraying of all adhesives should be done in the hood.

4. Drying of the processed material from the photoprocessor could be done by hanging them vertically in the hood.

5. The wastebaskets should be covered as some materials which are not completely dry, are placed in the baskets and the vapors and gases continue to be released into the work room air.

6. There is a glare on the screen of the VDT unit that may be increasing the frequency of headaches among the operators. A glare screen (usually available from the manufacturer) should be installed. General recommendations for VDT units are outlined in a NIOSH research report titled, "Potential Health Hazards of Video Display Terminals", NIOSH Publication No. 81-129. These recommendations were sent with the interim report.

7. The chairs used by the VDT operators should be fully adjustable to account for variations in body sizes.

8. As a safety item, the support for the shelf mounted on the dutch door is extremely close to the door knob making the knob difficult to turn. This support should be moved over several inches.

IX. REFERENCES

1. NIOSH Manual of Analytical Methods, Vol. 1 - 7.

2. Occupational Diseases: A Guide to their Recognition. NIOSH Pub. (77-181).

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XI. 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. North Clackamas School District No. 12, Milwaukie, Oregon.

2. Oregon State Accident Prevention Division, Salem, Oregon.

3. U. S. Department of Labor, Occupational Safety and Health Agency (OSHA), Region X, Seattle, Washington.

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 1

Acetic Acid, Carbon Dioxide
Temperature and Humidity Results of
the Phototypesette Work Station

North Clackamas School District No. 12
Milwaukie, Oregon

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Date	Time	Temperature F°	Humidity %	Carbon Dioxide ppm	Acetic Acid ppm
2-15-83	7:25a	72	38	400	2
	8:45a	74	36	500	<1
	10:00a	75	37	600	<1
	11:00a	75	36	600	<1
	12:15p	76	38	600	<1
	2:15p	77	37	600	<1
	3:15p	76	38	650	<1
2-16-83	7:05a	71	41	400	<1
	8:20a	73.5	40.5	500	<1
	9:30a	73.5	40	500	<1
	10:40a	74.5	40	550	<1
	11:25a	75	37	550	<1
	12:45p	75	36	650	<1
	1:45p	75.5	36	650	<1
	2:45p	75	36	600	<1

Table 2

Acetic Acid; Ammonia; Stoddard Solvent; 1,1,1 Trichloroethane
Air Concentrations

North Clackamas School District No. 12
Milwaukie, Oregon

HHE 83-014

Location	Date	Time	Substance	Concentration
General area between the two phototypesetting units	2-15-83	7:15a 3:15p	Acetic Acid	0.6 ppm
			Ammonia	<0.1 ppm
			Stoddard Solvent	1.0 ppm
			1,1,1 Trichloroethane	0.1 ppm
General area between the two phototypesetting units	2-16-83	7:05a-2:50p	Acetic Acid	0.3 ppm
			Ammonia	<0.1 ppm
			Stoddard Solvent	<0.1 ppm
			1,1,1 Trichloroethane	<0.1 ppm
In waste basket where processed paper was discarded	2-51-83	3:00p	Acetic Acid	10 ppm
BZ while using the photoprocessor - process takes approximately 30 seconds 20-30 times a day	2-15-83	9:15a	Acetic Acid	2 ppm
		10:20a	Acetic Acid	2-3 ppm