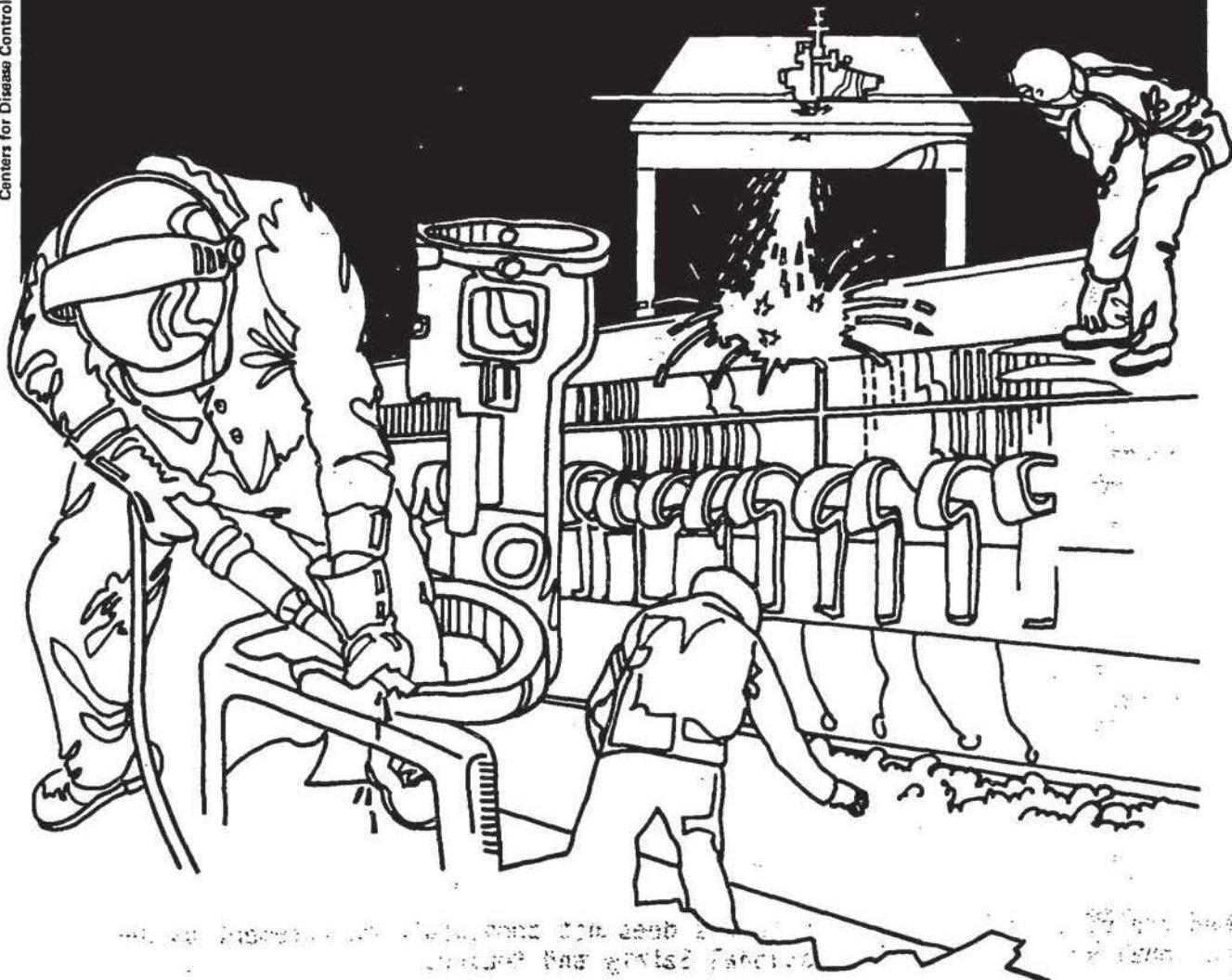


NIOSH



Health Hazard Evaluation Report

HETA 81-153-884
BUREAU OF LAND MANAGEMENT
CHEYENNE, WYOMING

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 81-153-884

MAY 1981

BUREAU OF LAND MANAGEMENT
CHEYENNE, WYOMING

NIOSH INVESTIGATORS:
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I. SUMMARY

On April 2, 1981, the National Institute for Occupational Safety and Health (NIOSH) provided technical assistance to the Bureau of Land Management (BLM), U.S. Department of Interior, Cheyenne, Wyoming, in evaluating possible health hazards caused by the work environment. Employee complaints were limited to the fourth floor of a 5-story building. Exposures in the area of the complaints were thought to be generated either by a blueprint copying machine that could emit ammonia or from a film developing operation that could emit acetic acid. Complaints consisted of headaches, eye and throat soreness, running nose, and shortness of breath.

Direct reading air samples were taken in the film developing room, printing room, and throughout all of the 4th floor for acetic acid, ammonia, carbon dioxide, carbon monoxide, formaldehyde, and ozone. The only chemical that was detected was acetic acid in the film developing room. The highest level found for acetic acid was 3 to 5 parts per million (ppm) which is below the Occupational Safety and Health Administration (OSHA) standard and the 1980 Threshold Limit Value (American Conference of Governmental Industrial Hygienists) of 10 ppm.

Workers were informally interviewed. Complaints were similar to those found in an epidemiological investigation performed by the Center for Disease Control (CDC) and NIOSH in the summer of 1979 (EPI-79-72-2).

The air conditioning and heating systems were evaluated and appeared to be working correctly.

The most probable cause of the employee complaints was due to cigarette smoke. Approximately 80% of the workers on this floor smoke. During the time of this survey, cigarette smoke was concentrated on this floor.

On the basis of the data obtained in this investigation, NIOSH has determined that the personnel in this facility were not overexposed to chemical hazards. The probable cause of the complaints is due to concentrated cigarette smoke. Recommendations to reduce exposure were given at the time of the survey and are presented in this report.

KEYWORDS: SIC 9199 (General Government/Not Elsewhere Classified), acetic acid, ammonia, office environment, cigarette smoking

II. INTRODUCTION

In January 1981 NIOSH received a request from the Bureau of Land Management, U.S. Department of Interior, to re-evaluate the potential hazards in an office situation at Cheyenne, Wyoming. A previous epidemiological investigation conducted in the summer of 1979 by the Center for Disease Control (CDC) and NIOSH indicated that additional ventilation be installed mainly to reduce the emissions coming from the blueprint copying machine and the film developer (EPI-79-72-2).

On April 2, 1981, direct reading air samples for acetic acid, ammonia, carbon dioxide, carbon monoxide, formaldehyde, and ozone were measured by NIOSH. Verbal recommendations were given at this time for improving the work environment.

III. BACKGROUND

The Wyoming State Office of the Bureau of Land Management moved into the Lea Building in Cheyenne in May 1978. Previously the office had been located mostly in one federally owned older building in Cheyenne, although several small units were in other locations. The Lea Building was built and is owned by a private firm that leased the fourth, fifth, and most of the third floor of the 5-story building to BLM through the Regional Office of the General Services Administration in Denver.

Exposures in the area of the complaints were thought to be generated either by a blueprint copying machine that could emit ammonia or from a film developing operation that could emit acetic acid. Complaints consisted of headaches, eye and throat soreness, running nose, and shortness of breath.

The complaints which led to this investigation were concentrated on the fourth floor and could not be linked to any chemical exposures.

IV. ENVIRONMENTAL DESIGN AND METHODS

All measurements were performed on site with direct reading detector tubes. Air samples were taken to measure acetic acid, ammonia, carbon dioxide, carbon monoxide, formaldehyde, and ozone.

Workers were informally interviewed. Complaints were similar to those found during the previous study performed by CDC and NIOSH in the summer of 1979.

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), 1980, (2) the NIOSH criteria for a recommended standards, and (3) the Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), July 1980.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis (ppm)	
Acetic acid.....	10 (TLV)	10 (OSHA)
Ammonia.....	25 (TLV)	50 (OSHA)
Carbon dioxide.....	5,000 (TLV)	5,000 (NIOSH)
Carbon monoxide.....	50 (TLV)	35 (NIOSH)
Formaldehyde.....	2 (TLV)	2 (NIOSH)
Ozone.....	0.1 (TLV)	0.1 (OSHA)

ppm = parts of vapor or gas per million parts of contaminated air by volume.

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

Acetic Acid -- Acetic acid is a local irritant and may produce bronchitis and ulceration of the digestive tract. High exposures may cause darkening of the skin. Chronic respiratory effects may occur. Workers with eye, skin, and lung problems should not work around acetic acid.²

Ammonia -- Ammonia is a pulmonary irritant and may cause irritation and burns on the skin and mucous membranes. Headaches, nausea, vomiting, and pulmonary edema may also occur from high exposures. People with eye and pulmonary disease should not work around ammonia.³

Carbon Dioxide -- Carbon dioxide is a stimulant of the central nervous system. Concentrations in excess of 5,000 ppm produce headaches and dizziness with increased respiratory rate. Solid carbon dioxide can produce skin burns. Adequate ventilation should prevent the accumulation of carbon dioxide.⁴

Carbon Monoxide -- The signs and symptoms of carbon monoxide poisoning may include headache, nausea, vomiting, dizziness, drowsiness, and collapse. In the bloodstream, carbon monoxide rapidly binds to the oxygen-carrying molecule hemoglobin, forming "carboxyhemoglobin" (COHb). When carbon monoxide binds with hemoglobin to form COHb, it reduces the oxygen-carrying capacity of the blood. The more COHb is formed, the more significant the symptoms are. Heart disease may be made worse in workers who have coronary heart disease and are exposed to carbon monoxide concentrations high enough to produce a COHb level greater than 5%. There is also important evidence that exposure to lower carbon monoxide concentrations, producing COHb levels below 5%, affects the nervous system and causes changes in visual alertness, response time, and fine judgment.

Non-smoking, non-exposed persons have an average COHb level of 1%. Cigarette smokers usually have an average COHb level of 2 to 10%. Non-smokers exposed to 50 ppm (50 parts per million of carbon monoxide, the OSHA standard) for six to eight hours have COHb levels of 8 to 10%. Symptoms such as headache and nausea may be seen above 15%, but usually not at lower levels. At 25%, there may be electrocardiographic evidence of heart effects, and 40% usually results in collapse.

The current OSHA standard for carbon monoxide is 50 ppm. Exposure at this level for 90 minutes may cause chest pain for persons with angina (chest pain related to heart disease); exposure for 2 hours may make leg cramps worse for persons who have leg cramping associated with vascular disease. The effects of carbon monoxide exposure, including the more common symptoms of headache, dizziness, and nausea, are made worse by heavy labor and a high temperature in the work area.

In 1972, after considering all of these factors, NIOSH recommended an exposure limit of 35 ppm for an 8-hour time-weighted average, and a ceiling limit of 200 ppm. This recommendation is based on the concentration necessary to produce a COHb level of not more than 5%. The recommendation does not consider the smoking habits of workers since the COHb levels in smokers has generally been found to be in the 4 to 5% range, but may run as high as 10 to 15% in heavy smokers. Therefore, smokers who already have a blood level of 5%, and then are exposed in a work place with an average concentration of 35 ppm will have a total COHb of about 10%.

Formaldehyde -- Formaldehyde is a colorless gas with pungent odor. It is highly toxic either by inhalation or ingestion. Formaldehyde is an irritant, produces local necrosis, and is a strong sensitizer. Formaldehyde dermatitis is often seen among workers who assist pathologists. Formaldehyde may also cause discoloration of the skin. Inhalation of formaldehyde may cause pulmonary edema, chest constriction, headaches, and asthmatic-type symptoms among sensitized individuals.⁵ NIOSH recommends that formaldehyde be handled as a potential carcinogen.⁶

Ozone -- Ozone is a bluish colored gas with a pungent odor. The pulmonary system is the target area for ozone. Signs and symptoms of ozone exposure include eye irritation, cough, headache, vertigo, drowsiness, fatigue, and pulmonary irritation. Pulmonary edema from high exposures has been reported. These symptoms may persist for six to nine months. Permanent disability has not been reported.⁷ Ozone intoxication can mimic the common cold, influenza, sinusitis, bronchial asthma, bronchopneumonia, pulmonary embolism, and myocardial infarction.⁸ Maintaining levels below 0.1 ppm for an 8-hour day, 40-hour week should eliminate any medical problems and employee complaints.

VI. ENVIRONMENTAL RESULTS

All airborne direct reading levels of acetic acid, ammonia, carbon dioxide, carbon monoxide, formaldehyde, and ozone were below concentrations that could produce any symptoms. Three to five parts per million of acetic acid was the only contaminant that showed measurable quantities.

The air conditioning and heating systems were evaluated and appeared to be working correctly.

VII. DISCUSSION AND CONCLUSIONS

Based on the data obtained during this survey, a health hazard did not exist from overexposure to acetic acid, ammonia, carbon dioxide, carbon monoxide, formaldehyde, and ozone. The most probable cause of employee complaints is due to high levels of cigarette smoke. The high levels were produced by approximately 80% of the workers smoking.

VIII. RECOMMENDATIONS

The following recommendations are offered to assist in eliminating employee complaints.

1. Cigarette smoking should be prohibited in the work area. A properly ventilated smoking lounge should be provided and workers who smoke should be limited to the use of this area for smoking.
2. Chemical emissions coming from blueprint and other copying machines were below detectable levels. Therefore, adequate ventilation has been provided for these machines. Employees were not complaining in these immediate areas. It should also be noted that emissions from these rooms are not the cause of the employee complaints.

IX. REFERENCES

1. Epidemiological Investigation Report, EPI-79-72-2, Center for Disease Control, Atlanta, Georgia, May 23, 1980.
2. Plunkett, E.R.: Handbook of Industrial Toxicology. Chemical Publishing Co., Inc., New York, pp. 2-4 (1976).
3. Ibid., pp. 23-24.
4. Ibid., pp. 85-86.
5. Ibid., pp. 190-191.
6. NIOSH Current Intelligence Bulletin 34 - Formaldehyde: Evidence of Carcinogenicity. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, April 15, 1981.

7. Plunkett, pp. 315-316.
 8. Proctor, N.H.: Chemical Hazards of the Workplace. J.B. Lippincott Company, Philadelphia, pp. 396-397 (1978).

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, 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. Bureau of Land Management, Cheyenne, Wyoming.
 2. U.S. Department of Labor/OSHA - Region VIII.
 3. NIOSH - Region VIII.
 4. Wyoming Division of Health and Medical Services.
 5. State Designated Agency.

TABLE 1

Results of Detector Tube Samples

Bureau of Land Management
U.S. Department of the Interior
Cheyenne, Wyoming

April 2, 1981

Location	ppm					
	Acetic Acid	Ammonia	Carbon Dioxide	Carbon Monoxide	Formaldehyde	Ozone
Film Developing Room	3-5	*	*	*	*	*
Printing Room	*	*	*	*	*	*
Offices - 4th Floor	*	*	*	*	*	*
Limits of Detection:	3-5	5	1000	5	0.5	0.05

* = none detected