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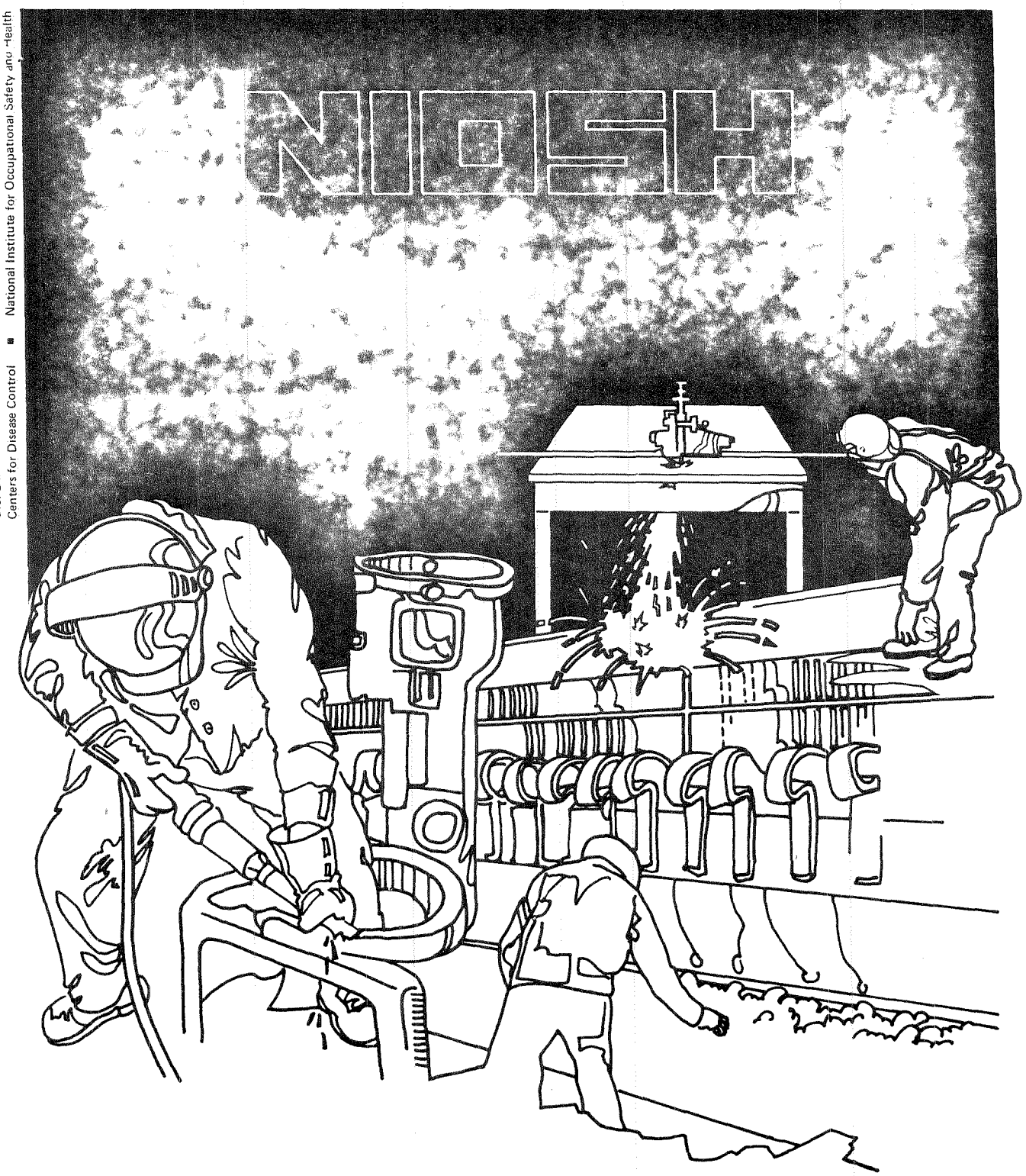

Health Hazard Evaluation Report

80-166-788

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. 699(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.

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DECEMBER 1980
MOUNTAIN BELL
LAKEWOOD, COLORADO

NIOSH INVESTIGATORS:
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I. SUMMARY

In June 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request from Mountain Bell to evaluate exposures to carbon monoxide at their Lakewood, Colorado, facility. An industrial hygiene evaluation was performed on June 24, 1980, and November 24, 1980, by taking general room air samples for determination of potential exposures to carbon monoxide (CO). The only source of CO at this facility was the potential for recirculation of exhausted boiler gases. Therefore, samples were taken on the roof of this facility at the boiler exhaust stack. A constant reading of 85 parts per million (ppm) CO was observed. Since intake ventilation is located very close to the boiler exhaust, it is possible that the boiler exhaust gases including CO could be drawn back into the intake ventilation. These excessive levels were perhaps the cause of the employee complaints of headache, dizziness, and nausea.

All inside areas of this facility were monitored for CO. All levels were below the NIOSH evaluation criteria of 35 ppm. Levels ranged on the days of the surveys from 5 to 15 ppm. All surveys were performed early in the morning during temperature inversion. This correlated very well with the time of complaints.

On the basis of the environmental data, NIOSH concluded that a health hazard could occur from exposure to carbon monoxide at Mountain Bell, 3898 Teller, Lakewood, Colorado. Recommendations on ventilation necessary to control the hazard are included on page 4 of this report.

KEYWORDS: SIC 7399, carbon monoxide, telecommunications.

II. INTRODUCTION

NIOSH received a request in June 1980 from management at Mountain Bell to determine if there was a health hazard to exposure to carbon monoxide at the training center, Lakewood, Colorado. An environmental evaluation was conducted on June 24, 1980, and November 24, 1980.

III. BACKGROUND

This request originated from plant management at the Mountain Bell training facility. This facility is a hotel/motel with training rooms and total live-in facilities. Several employees in the core wing, room 17, lunch room, and equipment room complained of headaches, dizziness, and nausea. These symptoms usually occurred between 6:30 a.m. and 8:00 a.m. This is the period when students would be showering and using lots of hot water which would cause the boiler to be operating at maximum output.

IV. ENVIRONMENTAL METHODS AND MATERIALS

Carbon monoxide was measured by using a direct reading carbon monoxide instrument. Measurements were taken on the roof of the building at the boiler exhaust and at the intake air vents. Measurements were also taken in all areas inside the facility.

V. EVALUATION CRITERIA

A. Environmental

Two sources of criteria were used to assess the workroom concentrations of carbon monoxide: (1) NIOSH criteria for recommended standards; (2) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910), January 1978.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis
Carbon monoxide.....	35 ppm (NIOSH) 50 ppm (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

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%.

VI. ENVIRONMENTAL RESULTS

The environmental samples that posed a health hazard were the excessive levels of carbon monoxide found at the boiler exhaust stack. Constant levels of 85 ppm carbon monoxide were observed at the exhaust of the boiler stack which was about ten feet from intake air vents. Low levels ranging from 5 to 15 ppm were found in two areas inside the facility (the telephone switchboard room and adjacent hallway). Higher levels could occur during temperature inversion when prevailing winds do not blow boiler stack emissions away from intake air vents.

VII. CONCLUSIONS

A health hazard existed at the time of this evaluation. This conclusion is based upon the potential for excessive exposures to carbon monoxide by drawing boiler exhaust gases back into the building through nearby intake ventilation.

VIII. RECOMMENDATIONS

1. The boiler stack on the roof of the building should be extended a minimum of ten feet. This would enable the exhaust gases to drift away from the intake ventilation ducts.

2. If workers complain of headaches, nausea, or dizziness, carbon monoxide samples should be taken immediately since during an inversion it would be possible for CO to enter the intake ventilation ducts.

3. No workers should be exposed to CO levels above the 35 ppm standard recommended by NIOSH.

4. Workers should be informed of the additive effects of cigarette smoke and occupational exposures of CO.

IX. AUTHORSHIP AND ACKNOWLEDGMENTS

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X. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Service, 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. Mountain Bell.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health
5. State Designated Agency

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

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