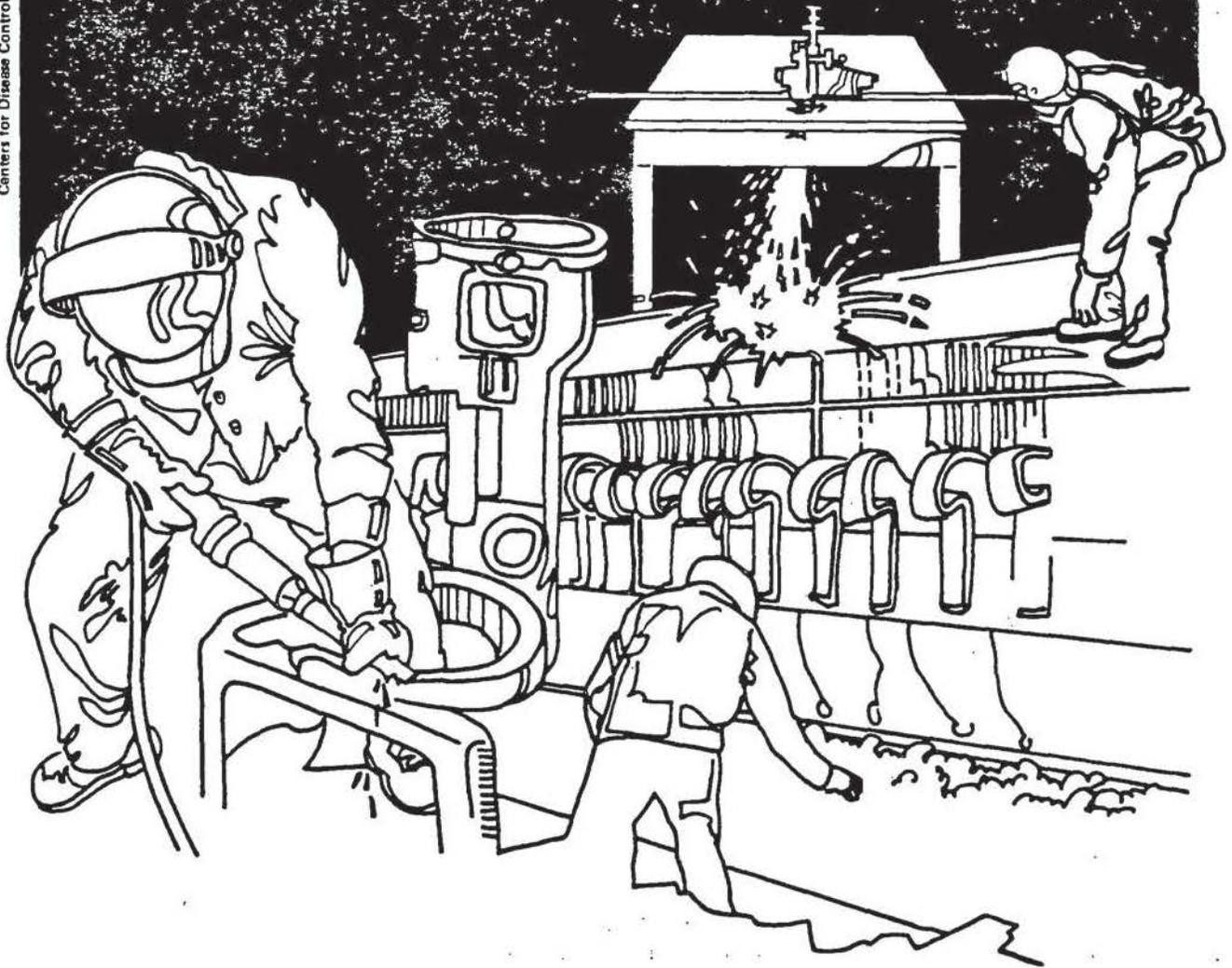


NIOSH



Health Hazard Evaluation Report

HETA 81-281-835
FRONTIER AIRLINES
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.

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

HETA 81-281-885
MAY 1981
FRONTIER AIRLINES
DENVER, COLORADO

NIOSH INVESTIGATOR:
Bobby J. Gunter, Ph.D., IH

I. SUMMARY

In April 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from management of Frontier Airlines to evaluate exposures to carbon monoxide at their air freight warehouse in Denver, Colorado. This request was prompted by a worker's complaint to management about the possibility of carbon monoxide exposures at the warehouse.

An industrial hygiene evaluation was performed on April 9, 1981, 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 emission coming from propane forklift trucks. This warehouse has large doors that are open most of the time. During this survey air samples were taken throughout all inside areas of the warehouse and directly in line with the forklift exhaust. The highest CO level observed was 35 parts per million (ppm) and was approximately one foot from the forklift exhaust. Levels did not exceed the NIOSH evaluation criteria of 35 ppm for a 10-hour time weighted average (TWA) exposure concentration or a 200 ppm ceiling concentration. Levels ranged on the day of the survey from 3 to 35 ppm.

On the basis of the environmental data, NIOSH concluded that a health hazard did not exist from exposures to carbon monoxide at Frontier Airlines' air freight warehouse in Denver, Colorado. Recommendations necessary to prevent future CO hazards are included in this report.

KEYWORDS: SIC 4511 (Air Transportation, Certificated Carriers), carbon monoxide, air freight facilities, forklift trucks.

II. INTRODUCTION

NIOSH received a request in April 1981 from management at Frontier Airlines to determine if there was a health hazard from exposures to carbon monoxide at their air freight warehouse in Denver, Colorado. An environmental evaluation was conducted on April 9, 1981.

III. BACKGROUND

This request originated from management at Frontier Airlines as a result of an employee's complaint in the air freight warehouse. There are eight to ten workers in the warehouse area. This warehouse is approximately 100 feet by 50 feet and has gas heaters suspended from the ceiling. The building has large doors on the north and south ends. These doors must remain open since customers are either picking up cargo or the warehouse workers are going in and out of the building delivering cargo.

IV. ENVIRONMENTAL METHODS AND MATERIALS

Carbon monoxide was measured by using a direct reading carbon monoxide instrument. Measurements were taken in all areas of the warehouse and in close proximity to the forklifts. Measurements were also taken on the forklifts in the operator's breathing zone during normal operation of the forklift.

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), July 1980.

	<u>Permissible Exposure Limits</u> <u>Time-Weighted Exposure Basis</u>
Carbon monoxide.....	35 ppm (NIOSH) (10 hr. TWA) 50 ppm (OSHA) (8 hr. TWA)

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, 8-hour TWA. 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 a 10-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

Low levels of carbon monoxide ranging from 3 to 35 ppm were found in the warehouse. Sampling was performed during routine operation and samples were collected in areas where the highest concentrations would be observed. All levels were extremely low and never exceeded the evaluation criteria. Under normal operation a health hazard should not exist from carbon monoxide in this warehouse.

VII. CONCLUSIONS

A health hazard from exposure to carbon monoxide did not exist at the time of this evaluation. This conclusion is based upon the low levels of carbon monoxide found during this survey.

VIII. RECOMMENDATIONS

1. Doors should remain open during peak usage of the forklift trucks.
2. No workers should be exposed to CO levels above the 35 ppm TWA standard recommended by NIOSH.
3. 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. Frontier Airlines.
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.

TABLE 1

Direct Reading Carbon Monoxide (CO) Concentrations
Air Freight Warehouse

Frontier Airlines
Denver, Colorado

April 9, 1981

Location	Carbon Monoxide (ppm)
Air Freight Desk/Loading Area	12
Air Freight Storage/North End Corner	8
Air Freight Storage/East Entrance	9
1 Foot from Exhaust of Forklift Truck	10
Directly in Exhaust of Forklift Truck	35
Outside of Air Freight/Next to Airline Runway	3

EVALUATION CRITERIA:	NIOSH	35
	OSHA	50
LABORATORY LIMIT OF DETECTION:		1