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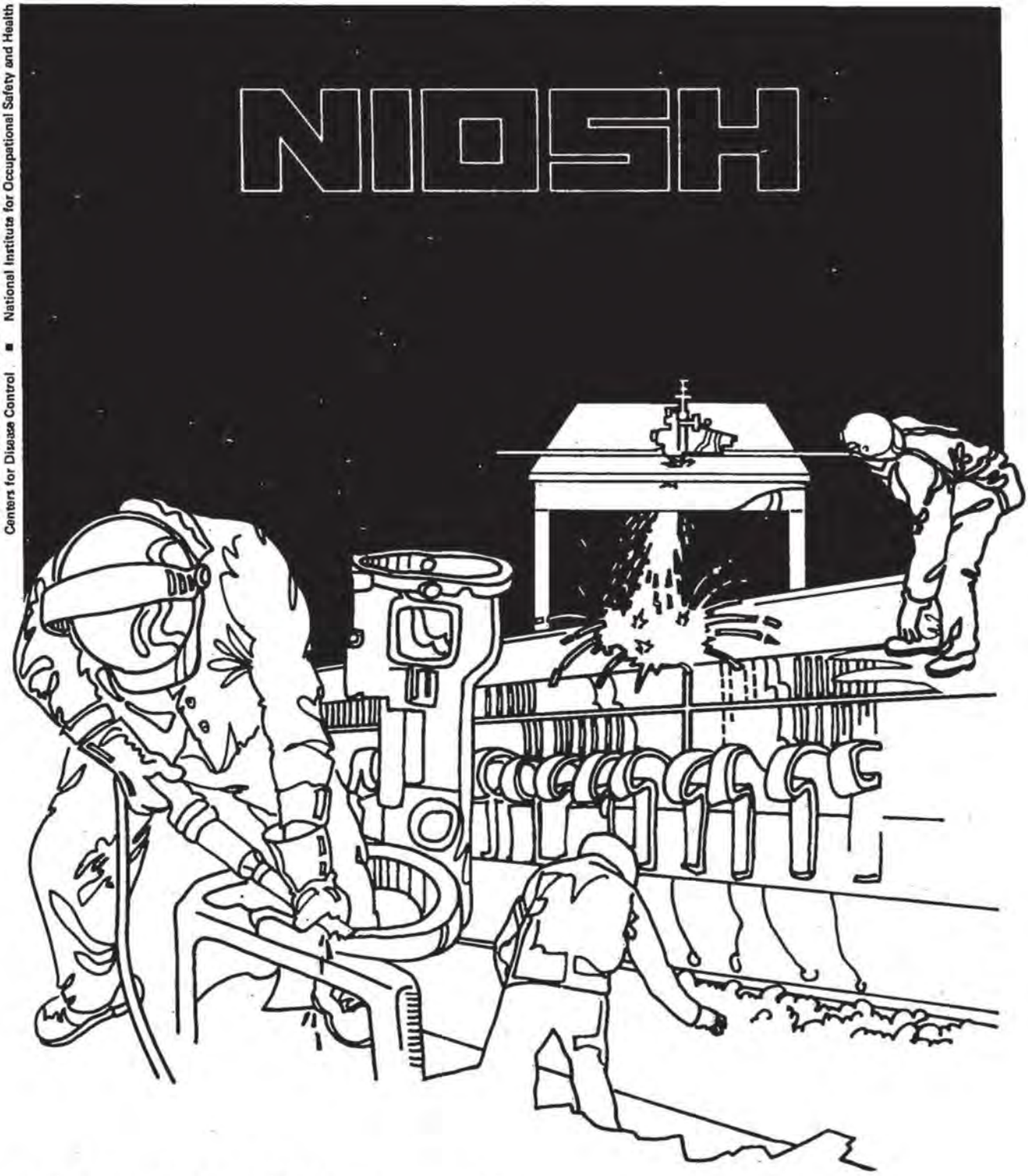

Health Hazard Evaluation Report

HETA 83-136-1398
SOCIAL SECURITY ADMINISTRATION
NEW BRUNSWICK, NEW JERSEY

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.

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I. SUMMARY

In February 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate employees at the Social Security Administration Office building in New Brunswick, New Jersey, for: (1) a possible increase in miscarriages and other reproductive problems among female employees, and (2) the possibility of residual health effects potentially associated with gasoline contamination of the building one year earlier.

On April 7 and 8, 1983, a NIOSH investigator visited the building and administered a short history questionnaire to 10 male and 34 female employees. Among the 34 women interviewed, there had been a total of 40 pregnancies; 11(28%) ended in miscarriages, and of five occurring in the past year, three (60%) ended in miscarriages. (The U.S. national miscarriage rate is 15%). In addition, two tubal pregnancies were reported in the past year. Other health effects, such as eye strain, headaches, and stress, were attributed by several employees to poor lighting and ventilation in the building.

Previous monitoring data showed that the concentration of gasoline vapors in the building work area, was never above 140 parts per million parts of air (ppm), which is below the lowest level (1160 ppm) known to be associated with health effects, and well below the current American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit Value (TLV) of 300 ppm for an eight-hour time-weighted average exposure and 500 ppm for a short-term exposure.

Based on data collected during the survey, NIOSH concluded that although the miscarriage rate among women employees appeared to be high, because of the relatively small sample size the apparent excess probably occurred by chance. Gasoline vapors do not currently pose a health hazard to Social Security Administration office employees and were not likely responsible for the apparently increased rate of miscarriages.

KEY WORDS: SIC 9441, (Administration of Social and Manpower Programs). spontaneous abortion, gasoline vapors.

II. INTRODUCTION/STATEMENT OF REQUEST

In February 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from the American Federation of Government Employees, Local 2369, for a health hazard evaluation at the Social Security office building in New Brunswick, New Jersey. The request cited two primary concerns: (1) a possible increase in miscarriages and other reproductive problems among female employees, and (2) the possibility of residual health effects from gasoline contamination of the building about one year earlier.

On April 7 and 8, 1983, a NIOSH medical investigator visited the office building and interviewed employees.

A letter was submitted to management on April 27, 1983, summarizing the survey's preliminary findings.

III. BACKGROUND

The office building was previously shared by the Social Security Administration (SSA) and the Internal Revenue Service (IRS). At the time of the survey only the SSA occupied the building. The 44 SSA employees, 34 women and 10 men, process social security claims. Except for the director and assistant director, who each have private offices, the employees all work at desks in one large open room.

In mid-January 1982, employees in the office building noticed a "gas" smell coming from an elevator shaft. This elevator shaft is located in a 10x15-foot room separate from the main office area. An investigator from the local gas company determined that the smell was caused by gasoline vapors, not natural gas, and suggested that they might be coming from the gasoline station across the street from the office building. Subsequently, the Occupational Safety and Health Administration (OSHA) made measurements beside the elevator door showing a vapor concentration of 500 ppm but detected no vapor in the office area. On February 1, 1982, a NIOSH and a General Services Administration industrial hygienist made measurements in the office area and in the elevator room and shaft using a Mine Safety Administration combustible gas indicator, which can detect vapor concentrations as low as 140 ppm. No vapor was detected in the office area. Vapor concentrations in the elevator room ranged from 140 to 600 ppm, and from 1400 ppm to 20% of the lower explosive limit in the elevator shaft. While steps were being taken to correct the problem, the local fire department decided to take daily measurements in the elevator to monitor for an explosive hazard. In the event the vapor

concentrations reached the explosive range, the building was to be evacuated immediately. Meanwhile, the New Jersey State Department of Environmental Protection worked to determine the source of the gasoline.

In mid-July 1982, OSHA was informed that the fire department had measured vapor concentrations in the building on six occasions but didn't order the building evacuated. OSHA investigated and found that there was a misunderstanding about where the explosive range of vapor could and could not exist. Vapors in the explosive range were measured in the elevator shaft on six separate occasions. As a result, OSHA issued an imminent danger situation to the management, and the building was evacuated for two weeks. In August 1983, the building owner installed an exhaust system in the elevator shaft which reduced vapor levels so that the building could be reoccupied. Only the SSA employees returned to the building.

The New Jersey Department of Environmental Protection determined that the gasoline had leaked from an underground storage tank belonging to a service station across the street from the office building and migrated under the street via the ground water system. The New Jersey Department of Environmental Protection subsequently closed the station and recovered 500 gallons of gas from the ground. At the time of this NIOSH survey they were recovering no gasoline from the pumping well but were planning on pumping two more months before stopping.

Even though the gasoline problem is apparently under control, the SSA has plans to relocate to a new building with more modern facilities.

IV. EVALUATION DESIGN AND METHODS

A short questionnaire on symptoms typically associated with gasoline fume exposure, and reproductive history was administered to the 10 male and 34 female employees divided by sex.

Air sampling for gasoline vapor was not conducted during the survey because most employees indicated that they had not been bothered by gasoline smells recently. In addition, the fire department's daily measurement data showed a gradual decline in vapor concentration over time, and the New Jersey Department of Environmental Protection was no longer recovering gas from the ground water system.

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).

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 primarily 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 only 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.

The current American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit Value (TLV) for gasoline is 300 parts per million parts of air (ppm) for an eight-hour time-weighted average exposure, and 500 ppm for a short-term exposure (15 minutes). [1] These concentrations were calculated on the basis of the individual TLV's of some 100 different parafinic, olefinic and aromatic hydrocarbons contained in gasoline. Estimations were made for those compounds without established TLV's. Neither OSHA or NIOSH have established limits for gasoline vapor exposure. The lower and upper explosive limit for gasoline vapors is 1.4% (14,000 ppm) and 7.6% (76,000 ppm). Under the Mine Safety and Health Act of 1969[5], when gasoline vapor concentrations reach 20% the lower explosive limit precautionary measures should be taken.

Table I summarizes published reports of human gasoline toxicity. Exposure to gasoline vapor produces eye, nose and throat irritation and central nervous system effects. Eye and respiratory irritation occurs between 500 and 1000 ppm. Dizziness and headaches are prominent at concentrations over 1000 ppm. Chronic effects of gasoline exposure have not been documented. The American Petroleum Institute began exposing male rats to high concentration of gasoline vapors in 1978. Some of these exposed rats developed kidney cancer later on in the test, but the significance of these results on human health is not known because of the difficulty in translating data from animal studies. Reproductive effects have not been associated with gasoline exposure.

TABLE I

Studies of human exposure to Gasoline Vapors

Concentration, ppm	Exposure Time, Minutes	Physiological/Sensory Effect
10,000	2-10	Nose and throat irritation in 2 min; dizziness in 4 min; signs of intoxication in 4-10 min. Definite intoxication
3,000	15	Dizziness, nausea
2,600	1 hr.	Dizziness
2,000	1 hr.	Dizziness, mucous membranes irritated and anesthesia
1,000	15	Drowsiness, dullness, numbiness
1,000	1 hr.	Dizziness, headache, nausea
1,000	30	Eye irritation only
900	1 hr.	Slight dizziness, irritation of eyes, nose and throat
550	1 hr.	Eye irritation
500	1 hr.	Eye irritation
300--- 700	18	No symptoms
160--- 270	8 hr.	Eye irritation
35	---	Odor Threshold (Ref 1)

VI. RESULTS

Among the 34 women in the office building, there has been a total of 40 pregnancies prior to and after coming to work at the Social Security Administration; 11 (28%) ended in miscarriages. Of five pregnancies occurring in the past year since the gasoline vapor in the building, three (60%) ended in miscarriages. In addition, there were two tubal pregnancies reported in the past year.

Ten employees reported being bothered by gasoline vapor once a day; twelve once a week, seven once a month, seven less than once a month, and five never. Several employees indicated that their answer to this question applied to the peak of the episode, i.e. early in 1982.

Fifteen (34%) of the 44 employees felt that they had health problems associated with work. The health problem listed most often (7 workers) was eye strain, followed by tension, stress, and/or nervousness (6) and headaches (5). Reproductive system problems other than miscarriages were reported by three workers. The reproductive problems included irregular menses, precancerous endometrium, and an unspecified chronic gynecologic problem following a miscarriage. Three people reported that the office environment aggravated sinus problems. Five (11%) employees cited the fluorescent lighting as being the cause of both eye strain and headaches. Poor ventilation was also a frequent complaint, (four employees). Only three workers felt that cigarette smoke was a problem.

VII. DISCUSSION/CONCLUSIONS

Spontaneous abortion (miscarriage) occurs at a 15% rate among the general population in the United States. [2,3] Therefore the 28% spontaneous abortion rate among the employees, and especially the 60% rate, occurring in the past year would appear to be abnormally high. However, because of the relatively small sample size, the apparent excesses might have been merely a chance occurrence. In any event, there is no evidence of biologically significant exposure to gasoline or other toxic substance that might plausibly be related to miscarriages.

Questionnaire data indicated that Social Security employees' exposure to gasoline vapors occurred only occasionally during a six month period. No gasoline vapor was detected in the Social Security office work area, but since the odor threshold of gasoline vapor is 35 ppm and the detection limit of the measurement instrument used in this building is 140 ppm, those employees smelling gasoline vapors were probably being exposed to concentrations between 35 ppm and 140 ppm. The lowest

level of gasoline vapor exposure reported to be associated with any health effect is 160 ppm. That health effect was eye irritation. (4)

Therefore, it appears that gasoline vapor exposure did not represent a health hazard to employees at the Social Security Administration office building.

The other health problems reported by the employees are common, and have a variety of causes, both occupational and non-occupational. Job stress, improper lighting, and inadequate ventilation are possible causes of discomfort and health problems, but these were not the subject of the NIOSH survey.

VIII. RECOMMENDATION

When the SSA relocates to a new building, ventilation and lighting engineers should be contracted to properly design the new building's ventilation and lighting systems.

IX. REFERENCES

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3. Miller, J.F., Williamson, J., Gordan, Y.B., Grudzinskas, J.G. and Sykes, A. (1980) Obstet. Gynec. Survey 36; 230

4. Runion, H.E., Benzene in Gasoline Amer. Industrial Hygiene Asso. J. p. 8, May 1975.

5. Federal Coal Mine Health and Safety Act of 1969, PL 91-173, Dec. 30, 1969.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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1. Social Security Administration
2. AFGE Local 2369
3. General Services Administration
4. NIOSH, Region II
5. OSHA, Region II

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.