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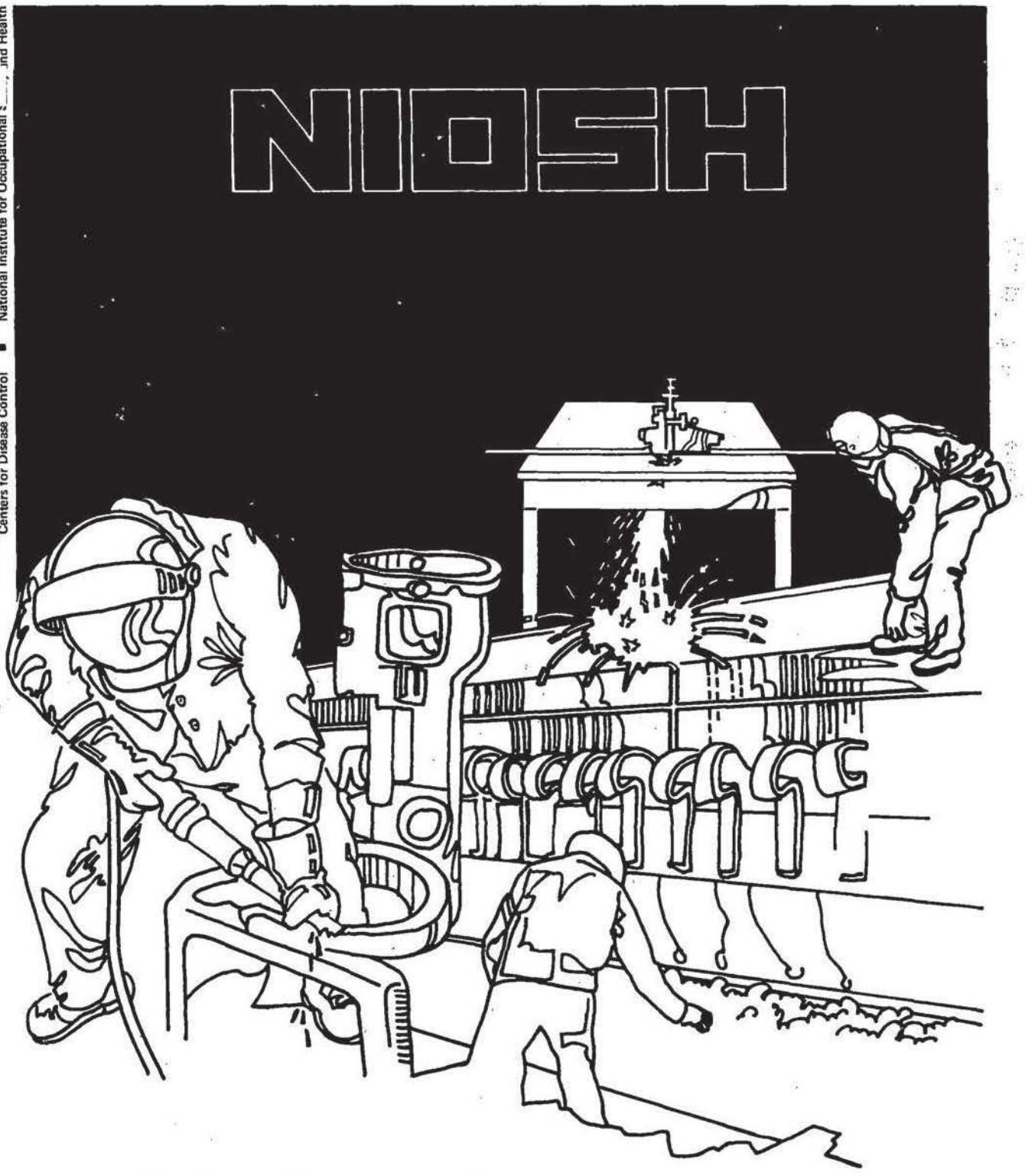

Health Hazard Evaluation Report

HETA 81-070-959
BERGEN COUNTY UTILITIES AUTHORITY
LITTLE FERRY, 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.

HETA 81-070-959
October 1981
Bergen County Utilities Authority
Little Ferry, New Jersey

NIOSH INVESTIGATOR
Nicholas Fannick, I.H.

I. Summary

In October, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request from Local 534, Utility Workers Union of America (UWUA) to conduct a health hazard evaluation at the Bergen County Utilities Authority, Little Ferry, New Jersey. The union requested that NIOSH review the Authority's health and safety practices with regard to entry into manholes. In July, 1979, two Authority employees were overcome by gases (tentatively identified as carbon monoxide and hydrogen sulfide) while working in a manhole. The union wanted to assure that the Authority provides adequate guidelines, procedures and equipment to protect employees who enter manholes.

In general, the current procedures for entry into and working in confined spaces conform to the general guidelines established in NIOSH's "Criteria for a Recommended Standard.....Working in Confined Spaces", DHEW Publication No. 80-106 (enclosed). The detailed recommendations listed in the main body of this report are based on the recommendations of the criteria document and on the findings of an ongoing NIOSH study of the entry procedures for the Cincinnati Metropolitan Sewer District.

KEYWORDS: SIC 4952--Sewerage Systems, confined space entry, carbon monoxide, hydrogen sulfide, combustible gases, lack of oxygen, toxic gases.

II. Introduction

On July, 27, 1979, two employees of the Bergen County Utilities Authority were overcome while performing a routine job of checking and cleaning a sewer line. The following account is based on newspaper articles and interviews with Authority personnel. After testing the air in the sewer shaft for combustible gases and oxygen content, the first employee donned a safety harness and entered the manhole. Halfway down the shaft, the employee fell and the rope attached to the safety harness pulled through the hands of the two men on the surface. The two men on the surface tried to pull the first employee out of the shaft, but could not. A second employee entered the shaft, without a safety harness, and fell when about halfway down. Reportedly, the probes of the air testing devices were about 15 feet long. The shaft was 35 feet deep (according to the newspaper account) or 80 feet deep (according to Authority personnel). When the two men in the shaft did not respond to shouts, the third employee turned on an air blower and went for help. The autopsy reports stated that the employees were overcome by carbon monoxide and hydrogen sulfide gases.

In October, 1980, NIOSH was requested to perform a health hazard evaluation by Local 534, Utility Workers Union of America (UWUA). The requestor stated that the union wanted a review of the manhole entry procedures and advice as to the type of air monitoring which would be necessary to define exposures to toxic substances so that adequate protective measures could be taken.

Due to jurisdictional problems (the Authority is part of a political subdivision), a NIOSH representative did not meet with the Authority management until February, 1981. At that time, the latest version of the Authority's entry procedures were reviewed and the NIOSH representative was shown the new tripod/safety harness arrangement to be procured for the manhole entry teams. The Authority is experiencing delays in shipment of the new tripods, which will not be available for several months.

III. Background

The Bergen County Utilities Authority maintains the sewer lines within Bergen County, New Jersey. It is headquartered at Little Ferry, New Jersey. The system has more than 1,000 manholes and the Authority has a work force of about 150 employees. The sewer shafts range in depth from 4 or 5 feet to about 80 feet. According to management, 25 to 30 employees comprising six teams of at least three employees each (with some exceptions) are required to enter manholes for inspection, cleaning, etc. Before the incident of July, 1979, one other fatality had occurred among Authority personnel--an electrocution in 1978.

The Authority randomly tests a number of sewer shafts for oxygen content and combustible gases each week. A number of the shafts have repeatedly not met the air quality standards, indicating too little oxygen and/or excessive concentrations of combustible gases.

IV. Review of Procedures

The Bergen County Utilities Authority currently has two written entry procedures. One for all standard manholes, defined as "manhole, meter pits, syphon chambers, regulators and diversion chambers and like underground structures" up to 25 feet deep, and a similar written procedure for entry into deep (more than 25 feet) manholes. The heart of the entry procedures is the use of a 10 to 12 feet high tripod equipped with two winches, each capable of supporting a 200 pound employee. Each employee who is to enter a manhole is to wear a sling-type safety harness which is connected above the shoulders to a steel cable which is in turn connected to an antifall unit and to a winch. The tripods are to be erected so that a disabled employee(s) could be raised high enough to be removed from the manhole opening.

Both the standard and deep manhole procedures call for the manhole to be opened and the atmosphere to be tested before entry and at 10 minute intervals for oxygen content and combustible gases. For entry to be permitted, the oxygen content shall be at least 19.5% and the combustible gas level shall be no more than 20% of the lower explosive limit (LEL). A blower hose shall be used at all times to ventilate the work level. A record shall be kept of the results of all atmospheric tests, the times of the tests and the names of the employees working on the crew.

In standard manholes, after the work level has been ventilated for 3 minutes and the air at that level has been tested and found to meet the above standards, the meter probe(s) shall be raised at 4 foot increments and the air tested at each level for one minute. In the deep manholes, after the work level has been ventilated for 6 minutes and the air at the work level found to meet the above standards, the meter probe(s) shall be raised at 6 foot increments and the air tested at each level for one minute. All atmospheric tests must meet the specifications listed above before the manhole can be entered. If the atmosphere should change to less than 19.5 % oxygen or more than 20% of the LEL, the employee below ground shall be notified to exit from the shaft. No more than two employees are permitted below ground at any time.

At standard manholes, either a two man team (one above and one below ground) or a three man team (one above and two below ground) are permitted. Two 50 feet coils of rope and a 30 minute "air breathing mask" shall be nearby. At deep manholes with one employee below ground, three employees shall be stationed above ground. With two employees below ground, three employee shall be stationed above ground. A "five minute escape breathing mask" shall be carried by each employee underground. Two 65 foot coils of rope and a 30 minute "air rescue" unit shall be nearby. The use of a tripod is mandatory at deep manholes. The use of a tripod at standard manholes is to based on availability. Where a tripod is not used, one employee, in harness, shall enter the manhole and two employees shall be stationed above ground. Two 50 feet coils of rope and a "thirty minute air breathing rescue pack" shall be nearby. Although not in the written procedures, the Authority management stated that the non-use of

tripods will be curtailed as the tripods are delivered, and ultimately, tripods will be used at all manholes except for very shallow ones, less than 6 feet deep.

V. RECOMMENDATIONS

While the Authority's entry procedures generally conform to the recommendations contained in NIOSH's Criteria document for entry into confined spaces, there are a few ambiguities and omissions which should be corrected.

1. The Authority's entry procedures, although clearly written, are often imprecise (as in using the terms "30 minute air rescue unit" and "30 minute air breathing rescue pack" for the same item). The entry procedures should be reviewed and revised to resolve these matters.

2. The Authority has purchased devices to monitor carbon monoxide and hydrogen sulfide levels. Operating instructions for these devices should be included in the entry procedures.

3. The Authority has established a LEL of 20% as exceeding their standards (in reality, the GX-3 Combustible Gas Meter has a built-in safety factor of 10%, so that 20% LEL is really 18% LEL, calibrated on a methane/air mixture). While limiting the exposure of personnel to atmospheres where the concentration of combustible gases is less than 20% of the LEL essentially will eliminate the possibility of explosions, it does not guarantee that personnel will not be exposed to hazardous concentrations of potentially toxic substances. Many industrial plants in Bergen County dump wastes into the sewer system. Industrial wastes, (solvents, etc.) may be hazardous at concentrations far less than 20% of their respective LELs. For example, 20% of the LEL for toluene is 240 parts per million parts of air (ppm). NIOSH recommends that exposures to toluene be controlled to 100 ppm average for an 8 hour work-day; and a 200 ppm ceiling for a 10 minute exposure. Furthermore, chlorinated hydrocarbons and corrosive compounds may erode the electric circuits of the less expensive type of combustible gas indicator, causing erroneous measurements. For these reasons, NIOSH recommends that the Bergen County Utillities Authority test the atmospheres in a representative number of manhole shafts to be able to characterize the contaminants present and their concentrations. With this knowledge, the Authority can develop a program to provide meaningful testing of the manhole shaft's atmospheres, provide appropriate personal protective equipment where necessary and/or provide increased air to the work site to protect personnel from potentially hazardous atmospheres.

4. After the airborne contaminants in the sewer shafts have been characterized, the Authority should innitiate an air monitoring program geared to monitor specific contaminants which have been characterized as being present in specific sewers. For example, perchloroethylene may be identified in sewer lines downstream from dry cleaning plants. Personnel who work in a sewer atmosphere containing perchloroethylene should not be exposed to more than 50 ppm of perchloroethylene vapor (as a time wieghted

average), or to 100 ppm as a ceiling (never to be exceeded). The Authority may choose either to increase the supply of fresh air to the work site or to supply personnel with approved respiratory protection.

5. The Authority should provide increased ventilation to work sites to assure that underground personnel are not exposed to excessive concentrations of contaminants known or suspected to be present in the atmosphere of individual sewer shafts. If that is not feasible, the Authority should provide approved respiratory protection to the underground workers.

6. The supply of the air blown into the sewer shafts should be kept away from any local sources of automobile and diesel emissions.

7. Industrial sites that are upstream of sewer line work sites should be contacted to prevent discharges into sewer lines so long as Authority personnel are underground, particularly if a long work time is required

8. Authority personnel should be trained in the new entry procedures and in the correct use of all safety and emergency equipment.

VI. References

Criteria for a Recommended Standard...Working in Confined Spaces, U.S. Department of Health, Education and Welfare, PHS, CDC, NIOSH, December 1979, (No. 80-106).

NIOSH/OSHA Pocket Guide to Chemical Hazards, U.S. Department of Health, Education and Welfare, PHS, CDC, NIOSH, September 1978 (No. 78-210).

NIOSH Interim Report #1, Health Hazard Evaluation Project No. HETA 81-207, Metropolitan Sewer District, Cincinnati, Ohio, March 1981.

NIOSH Interim Report #2, Health Hazard Evaluation Project No. HETA 81-207, Metropolitan Sewer District, Cincinnati, Ohio, April 1981.

VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

Evaluation conducted and Report Prepared by:

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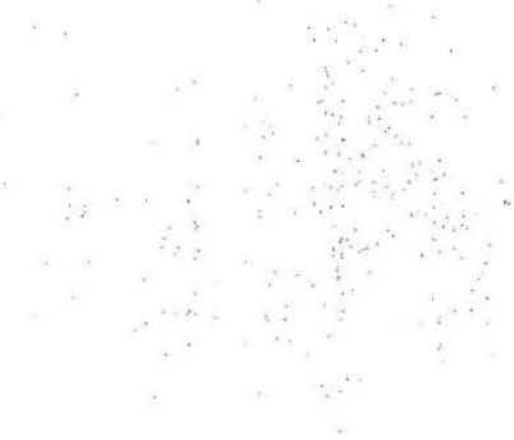
VIII. DISTRIBUTION AND AVAILABILITY OF REPORT

For the purpose of informing affected employees, the employer shall promptly post this report for 30 days in a prominent place(s) near where exposed employees work.

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) 5285 Port Royal Road, Springfield, Virginia 22151. Information regarding its availability from NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this Report have been sent to:

1. Local 534, U.W.U.A.
2. Bergen County Utilities Authority, Little Ferry, N.J.
3. U. S. Department of Labor, OSHA, Region II Office, N.Y., N.Y.
4. N. J. State Department of Health, Trenton, N.J.
5. U. S. Department of Health & Human Services, NIOSH, Region II Office, N.Y., N.Y.



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