The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

# Insufficient Oxygen Level in Sewer Claims the Life of Plumbing Contractor in Georgia

FACE 8654

## INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) Project, which is focusing primarily upon selected electrical-related and confined space-related fatalities. The purpose of the FACE program is to identify and rank factors that influence the risk of fatal injuries for selected employees.

On September 15, 1986, a plumbing contractor and two co-workers were in the process of laying out a new sewer line for an industrial building under construction when the fatal accident occurred. The owner of the plumbing company entered the manhole opening and descended into a 15 foot deep sewer to measure a stub out location for the new sewer line. Co-workers were unsuccessful at rescue attempts. The owner was removed by the fire rescue squad and pronounced dead on arrival at a local hospital. Atmospheric tests revealed the oxygen level at the bottom of the sewer to be six percent.

## CONTACTS/ACTIVITIES

Officials of the Department of Health for the State of Georgia notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. On September 25, 1986, the DSR research team coordinator conducted a site visit, met with the OSHA compliance officer and a fire department official, and interviewed a comparison worker and a surrogate for the victim.

## OVERVIEW OF EMPLOYER'S SAFETY PROGRAM

The victim operated a small plumbing contracting company and employed two other workers. The company did not have a written safety program or confined space entry procedures. At the time of the accident this company was under a subcontract agreement with a larger plumbing and heating contractor (employing ten). This larger contractor did not have confined space entry procedures either.

## SYNOPSIS OF EVENTS

On September 15, 1986, the victim and two other workers were planning to install a sewer line from a building to the main sewer line in the street at a construction site. The sewer vault was entered through a manhole in the middle of the street. The manhole was two feet in diameter and 15 feet deep. In an effort to measure the length of the sewer line snub, the victim entered the manhole and descended a fixed ladder, to the bottom. The sewer line snub extended from the vault, 15 feet towards the construction site. Upon reaching the bottom of the sewer he complained of a strong odor and then passed out. The other two workers that remained outside entered the manhole in an attempt to rescue the victim. However, before they could reach the victim, they both became dizzy and exited the manhole. Several unsuccessful rescue attempts delayed notification of the fire department rescue squad for approximately 20 minutes.

The rescue squad arrived in five minutes. Rescue squad personnel entered the sewer using self-contained breathing apparatus, life lines, and other personal protective equipment. The victim was removed approximately eight minutes after the arrival of the rescue squad. Attempts to resuscitate the victim were unsuccessful. The victim was then transported to the local hospital where he was pronounced dead.

Prior to entry the employer did not test the atmosphere or ventilate the sewer vault. The victim and the workers were not aware that entering the manhole might be hazardous. Prior to entering the manhole, the workers argued over who would go into the manhole. Their concern at that time was the depth of the hole. Additionally, the water company had informed the contractor of the location of the snub line, but the victim apparently wanted to double check the distance. No confined space entry procedures were used by the workers. The atmosphere was tested after the victim was removed and was found to contain 20% methane, 6% oxygen, and was negative for hydrogen sulfide and carbon dioxide.

## CAUSE OF DEATH

Asphyxia due to oxygen deficiency.

## RECOMMENDATIONS/DISCUSSION

**Recommendation #1: Employers should be certain employees are aware of the hazards associated with the tasks they are performing. Additionally, employees should be aware of all safety procedures to be followed and the reasons for these procedures.**

Discussion: Both the plumbing company and the larger contractor were not aware that a manhole was a confined space and as such was a hazardous place to enter. Neither company had any confined space procedures to follow when entering a manhole.

**Recommendation #2: Employers should initiate comprehensive policies and procedures for confined space entry.**

Discussion: All employees who work in or around confined spaces should be aware of potential hazards, possible emergencies, and specific procedures to be followed prior to entering a confined space. These procedures should minimally include the following:

1. Air quality testing to assure adequate oxygen supply, adequate ventilation, and the absence of all toxic air contaminants;

2. Monitoring of the space to determine a safe oxygen level is maintained;

3. Employee and supervisory training in confined space entry;

4. Employee and supervisory training in the selection and usage of respiratory protection;

5. Emergency rescue procedures;

6. Availability, storage, and maintenance of emergency rescue equipment.

The air quality was not determined before the worker entered the manhole and no ventilation was maintained. The air quality was not monitored for toxic air contaminants and oxygen level. Respirator training and proper maintenance procedures should be required of all employees.

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