The National Institute for Occupational Safety and Health (NIOSH)

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One Dead, One Near Miss in Sewer in Kentucky

FACE 8745

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 May 15, 1987, two laborers for the city sewer department entered a 15 foot-deep sewer manhole into an oxygen deficient atmosphere. When help arrived, both men were unresponsive. The men were removed from the manhole and transported to a local hospital. Prolonged resuscitation efforts were unsuccessful and one worker was pronounced dead by an attending physician two hours later. The second worker was treated and released.

Contacts/Activities:

The Division of Safety Research was notified of this fatality by the Water Pollution Control Federation (WPCF) and officials of the Occupational Safety and Health Program for the Commonwealth of Kentucky and technical assistance was requested. This case has been included in the FACE Project. Two research industrial hygienists from DSR and a physician (epidemiologic intelligence officer) from the Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS), conducted an epidemiologic evaluation of this case. On June 25, 1987, DSR researchers visited the site of the accident, tested the atmosphere in the manhole for oxygen (02), hydrogen sulfide (H2S), and flammability level (CH4); photographed the site; met with the superintendent and the assistant superintendent of the sewer department and the city safety/personnel director, and conducted interviews with comparison workers and a surrogate for the victim.

Background/Overview of Employer's Safety Program:

The employer in this incident is a small municipality which has 474 employees. The victim worked for the sewer department which has 14 employees: a superintendent, assistant superintendent, two crew leaders, two brick masons, two pipe layers, three operators, and three laborers. The municipality had no written safety policies or confined space entry procedures at the time of the accident. Safety on the job has been handled on an informal basis and left up to the individual worker.

Since the accident, the municipality has drafted up basic confined space entry procedures. These procedures aren't all inclusive for confined space entry; however, they are in writing and confined space training was initiated.

Synopsis of Events: S

On the morning of May 15, 1987, two laborers (the victim and a co-worker) were assigned the task of cleaning out a drainage ditch. After completing this assignment, the men reported back to the sewer department. At 11:30 a.m. the superintendent informed the two workers that the engineering department had reported a blockage in a sewer manhole adjacent to a sewage lift-station. The two laborers were instructed to take the sewer cleaning machine (a tank truck with a vacuum cleaning system and water jet) to the stopped up manhole and wait for the engineering department workers to arrive. The two laborers drove the sewer cleaning machine to the location of the manhole. They arrived at the manhole at approximately 1:00 p.m. and positioned the truck so that the manhole could be cleaned. One of the workers (the victim) removed the 22" diameter manhole cover, while the other worker was preparing equipment on the truck. After removing the manhole cover, the victim observed two boards stuck in the sludge (the sludge level was up 3 feet in the 12 foot-deep manhole and had formed a crust). The victim descended via an attached steel rung ladder into an untested, oxygen deficient atmosphere and attempted to remove the two boards stuck in the sludge. The co-worker noticed the victim had entered the manhole and went to investigate. The co-worker stated that “the victim was staggering, gagging, vomiting,” and then fell face down on the sludge. The co-worker called the sewer department and reported a man was down in the manhole and was in trouble. The superintendent told the worker to wait for help, do not enter the manhole. The co-worker entered the manhole in a rescue attempt and passed out, falling backwards, face-up.

When the engineering crew arrived (shortly before the emergency squad and fire department) both men in the manhole were unresponsive. The engineering crew lowered an eight inch diameter vacuum line from the sewer cleaning machine into the manhole and turned on the vacuum system.

The vacuum system quickly evacuated the air in the manhole, causing fresh make-up air from the exterior of the manhole to enter the manhole. The co-worker regained consciousness and stood up. A rope was lowered into the manhole and he was pulled out. Two firemen entered the manhole (with SCBA) and removed the victim. All four men (the victim, the co-worker, and the two firemen) were transported to a local hospital. Resuscitation efforts were continued on the victim for two hours, but were unsuccessful. The co-worker and the two firemen were treated and released.

Cause of Death:

The coroner listed the cause of death as “Prolonged acute exposure to sewer gas – aspiration of foreign material.”

NOTE: While conducting this evaluation the sewer manhole was tested for 02, H2S and CH4. The results of these tests:

02 7% H2S Negative CH4 Negative

Recommendations/Discussion:

Recommendation #1: The employer should develop a comprehensive safety program for confined space entry that clearly documents procedures for safe 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 include, but not be limited to:

1. Air quality testing to determine adequate 02 level.

2. Ventilation of the space to remove air contaminants.

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

4. Employee training in confined space entry, testing, and use of personal protective equipment (respirators, clothing, etc.).

5. Emergency rescue procedures.

Air quality was not tested prior to entry. Testing devices should be ordered and used for testing the atmosphere for 02, H2S, and CH4, Training on correct use of these devices, plus calibration of each should be stressed. Respirator training, fitting, and proper maintenance procedures should be required of all employees.

The following confined space reference materials were provided to the employer to assist in the development of a confined space program: NIOSH Criteria Document No. 80-106 “Working in Confined Spaces; NIOSH Alert 86-110 “Request for Assistance in Preventing Confined Space Fatalities”; NIOSH draft “A Worker’s Guide to Confined Spaces”; NIOSH training manual on confined spaces; and a confined spaces article from Professional Safety.

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Last Reviewed: November 18, 2015