The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Owner/Foreman of Construction Company Dies in 15 Foot-Deep Manhole in California

FACE 8705

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 October 14, 1986, the owner/foreman of a construction company (the victim) was found face down at the bottom of a 15 foot-deep manhole in approximately three feet of muddy water. Four workers entered the 24 inch diameter opening and removed the victim from the manhole without any ill effects. Resuscitation efforts failed to revive the victim, who was pronounced dead by the attending physician at a local medical clinic. The incident occurred at a park.

Contacts/Activities:

The Water Pollution Control Federation (WPCF) notified the Division of Safety Research of this fatality and requested assistance. This case has been included in the FACE Project. On October 11, 1986, two research industrial hygienists conducted a site visit, met with the park ranger, interviewed two comparison workers and a representative of the employer, and interviewed a surrogate for the victim.

Background/Overview of Employer's Safety Program:

The construction company has 13 employees and had been subcontracted to install a sewage collection system which consisted of 20,000 feet of 6 and 8 inch pipe and 80 manholes.

The prime contractor has written safety rules. Safety meetings discussing basic safety issues relevant to the job being performed are conducted on a regular basis by the prime contractor and the subcontractor. No training had been given concerning confined space entry; however, this subject had been discussed by the prime contractor and the subcontractor as a future training need, since the workers would be required to enter the manholes previously installed.

Synopsis of Events:

Prior to the day of the accident the manhole involved in this incident had tilted about 10 degrees because heavy rains caused the backfill to settle unevenly. An effort to straighten the manhole resulted in extensive damage to a section of the concrete cylinder, five to seven feet below the ground surf ace. This damage permitted mud and water to seep into the manhole. At the time of the accident the manhole had not yet been connected to any of the sewer lines which had been laid.

On October 14, 1986, the subcontractor's construction crew was installing a section of sewer pipe, approximately 100 feet south of the manhole where the accident occurred. The owner/foreman (the victim), who was operating a backhoe, requested that one of the workers remove the manhole cover so that the victim could "check the grade". The victim then finished excavating the trench for the section of pipe that the crew was installing. Shortly after completion of the excavation, one of the workers observed the victim walking towards the manhole. About fifteen minutes later the worker looked into the manhole and saw the victim face down in the muddy water at the bottom. He immediately called to the other crew members for help.

In response, two workers climbed down into the manhole to rescue the owner. One of the workers feeling "breathless and nauseated", due to what he felt was excitement and exertion, climbed back out. Two other workers entered the manhole, placed a chain around the victim, and assisted in pulling the victim out of the manhole. None of the other workers who entered the manhole experienced any ill effects. The workers then began cardiopulmonary resuscitation (CPR) on the victim until the rescue squad arrived. The victim was rushed to a nearby medical clinic where he was pronounced dead about 90 minutes after being removed from the manhole. Although there were no witnesses to the accident, the medical examiner's report suggests that the victim slipped and fell while entering the manhole, was knocked unconscious, and subsequently drowned in the water at the bottom. If this is the came, it is not clear why the victim felt he needed to enter the manhole since the grade could have been checked from the outside and thus entrance into the confined space would not have been necessary.

An Industrial hygiene consultant firm was contacted by representatives of the park. The consultants tested the atmosphere in the manhole and another manhole further east the day after the incident. Their findings indicated that the air samples contained "...normal levels of oxygen (20.5%) in both manholes Tests for carbon monoxide, carbon dioxide, and other gases were" ... well below levels that would be noxious".

It should be noted that the unconscious "Man down" is often due to a hazardous atmosphere. A hazardous atmosphere and the impromptu rescue response that occurred during this incident could have easily resulted in multiple fatalities, which are typical of many confined space-related incidents.

Cause of Death:

The medical examiners report indicates that the victim was knocked unconscious from falling and drowned.

Recommendations/Discussion:

Recommendation #I: A trained standby person should remain outside of the confined space when a worker enters or works inside. The standby person should visually monitor the tasks being performed inside and should be able to communicate with the worker(s) inside the confined space.

Discussion: A person trained in emergency rescue procedures, assigned to remain on the outside of the confined space for communication and visual monitoring of the person inside is of utmost importance and might have prevented this fatality.

Recommendation #2: Employers should develop a comprehensive safety program that clearly documents procedures for safe entry into confined spaces.

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. Standby person outside the space for communication and visual monitoring.

6. Emergency rescue procedures.

Even though normal oxygen levels were found In air samples taken from two manholes after the accident, entry into confined spaces should not be attempted until atmospheric testing of the confined space insures that the atmosphere in safe. This testing required applies to all confined spaces, including those under construction. Testing must be done by a qualified person prior to entry.

Recommendation #3: Property owners that contract construction projects should require that a safety program be implemented. The owner should assure that all safety requirements are enforced.

Discussion:

When hazardous tasks such as confined space entry are to be performed by contractors or subcontractors, the contract should require compliance with safe work procedures. These requirements should be enforced by the company letting the contract. Specific recommendations regarding safe work practices in confined spaces can be found in the NIOSH Publication No. 80-106, “Working in Confined Spaces”. This publication also defines and provides recommendations on hot work, isolation, purging, ventilation, communication, entry and rescue, training, posting, safety equipment, clothing, etc.

Return to In-house FACE reports

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