The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Laborer Electrocuted in Maryland

FACE 87-09

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 22, 1986, a laborer was electrocuted when he contacted a 13 kV, underground power line while digging with a pneumatic clay spade.

Contacts/Activities:

Officials of the Maryland Occupational Safety and Health (MOSH) Administration notified the Division of Safety Research of this fatality and requested technical assistance. This case has been included in the FACE Project. NIOSH research personnel have conducted a site visit, met with owner and employer representatives, interviewed two comparison employees, and photographed the site.

Background/Overview of Employer's Safety Program:

The employer is a small company that specializes in the construction of caissons. Caissons are defined as shafts drilled into the ground, which are encased with a metal shell and then filled with concrete. The caisson is used at sites where the soil has low bearing capacity and it is necessary to transmit the loads to a firmer strata. NOTE: The caissons referred to throughout this report were called caissons by the construction workers and would be termed open-end caissons by foundation engineers; however, these shafts do not satisfy the definition of a caisson as delineated in 29 CFR 1926.804(b) because these chambers are not air- and water-tight.

The employer has a written safety program and policy; however, these do not appear to be implemented on a daily basis.

Synopsis of Events:

The employer of the victim was a subcontractor on a construction job that required the repair of the foundation of a tunnel between two buildings. The tunnel had been built on uncontrolled, ruble fill (i.e., waste concrete, scrap steel, debris, and backfill) and was settling. Caissons that extended below the tunnel foundation were to be constructed, the tunnel

foundation was to be supported from below, and the caissons were to be filled with concrete. Initially an auger was used to excavate the caissons; however, after drilling approximately two feet deep the workers hit materials that required them to excavate the remainder of the caissons by hand. Each hole was lined with steel casing, 30 inches in diameter. One worker (a bottom man) would loosen the material at the bottom of the hole with a pneumatic clay spade and then load this material into a bucket, which was raised to the surface and emptied by a co-worker (a top man). The crew had been excavating by hand for several weeks and the shaft where the victim was working was approximately 26 feet deep.

At approximately 3:00 p.m. on October 22, 1986, a caisson laborer (the victim) was digging in one of the shafts with a pneumatic clay spade when he contacted a 13 kV, underground electrical power line.

Co-workers heard noises coming from the hole. The steel casing in the hole began vibrating and fire came out of the top of the hole. Five minutes after this initial contact, co-workers notified emergency medical personnel and the local electrical utility. Rescue could not be initiated until the power was disconnected, which was approximately 20 minutes after the incident occurred. Emergency medical personnel could not enter the caisson for five or ten minutes after the power was disconnected because of the heat generated as a result of the contact with the electric power line. The body was removed from the caisson at 3:51 p.m.

Cause of Death:

The medical examiner determined the cause of death as electrocution. The victim's body was burned almost beyond recognition. An autopsy was not performed.

Recommendations/Discussion:

Recommendation #1: All underground utilities should be identified prior to the start of drilling or excavating.

Discussion: According to interviews with the principals involved, the owner apparently provided the general contractor a set of plans for another facility (similar to, but not identical to, the accident site). The contractor and subcontractor relied on these drawings and did not contact underground utility identification services before drilling.

Recommendation #2: Owners and designers must provide accurate plans to contractors and subcontractors.

Discussion: The plans provided to the contractor apparently did not accurately locate the underground power line. This occurred even though the owner had contracted with an engineering design firm to develop the project design and monitor this effort. Plans of a similar facility were provided so that construction could be started quickly. Scheduling, productivity, or cost effectiveness should not be permitted to adversely impact the safety of workers.

Recommendation #3: Underground electrical power lines should be identified through the use of warning tape or other appropriate means.

Discussion: The power line was buried beneath 26 feet of backfill that included concrete, scrap steel, etc. The victim did not recognize that he was digging into an electrical power line. The buried electrical power lines should have been identifiable by a change in the consistency of the backfill (i.e., sand, crushed stone, or earth) and should have been marked by warning tape.

Recommendation #4: The employer should develop a comprehensive safety program that clearly documents procedures for safe entry into confined spaces.

Discussion: The shaft that the victim was in at the time of the accident was a confined space and as such all applicable requirements concerning confined spaces should be followed. 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 the following:

1. Air quality testing to determine adequate 0_2 level.

2. Ventilation of the confined space to remove air contaminants.

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

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

5. A standby person outside the space for communication and visual monitoring.

6. Emergency rescue procedures.

Even though normal oxygen levels were obviously present in the shaft at the time of the accident, entry into confined spaces should not be attempted until atmospheric testing of the confined space insures that the atmosphere is safe. This testing requirement applies to all confined spaces, including those under construction. Testing must be done by a qualified person prior to entry.

Recommendation #5: Employees working in a confined space, particularly one that severely restricts rescue efforts, should wear a lifeline at all times.

Discussion: The victim was not wearing a lifeline at the time of the accident. Although the use of a lifeline probably would not have altered the fatal outcome of this event, a lifeline could be a life saving device under certain circumstances and should be used at all times.

Recommendation #6: Pneumatic tools should be secured to the hose by some positive means.

Discussion: The use of pneumatic tools in a confined space could result in a severe injury, if the hose, while still under pressure, were to become disconnected from the tool. Pneumatic tools should be secured to the hose by some positive means to prevent the tool from becoming accidently disconnected (29 CFR 1926.302). This will prevent the hoses from whipping around violently, if they were to become disconnected.

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Last Reviewed: November 18, 2015