The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research NIOSH

Worker Dies in Excavation Collapse in Arizona

FACE-8513

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 electrically-related fatal injuries and confined space fatalities. By scientifically collecting data from a sample of fatal accidents, it will be possible to identify and rank factors which influence the risk of fatal injury for selected employees.

On March 25, 1985, two construction workers were shoveling loose dirt from the bottom of an unshored 21' deep excavation in order to accommodate a fabricated trench shield. During this shoveling they noticed earth material begin to fall from one corner wall. As the workers started to exit the excavation, an upper corner of the excavation gave way and buried one worker. The other worker, who had moved clear from the falling material, unsuccessfully attempted to dig him out. A fire rescue team dug out the trapped worker and transported him to a local hospital where he died in surgery.

Contacts/Activities

The Division of Safety Research was contacted by the Division of Occupational Safety and Health, Industrial Commission of Arizona, to provide technical assistance regarding this fatality. It was determined that this fatality would be included in the FACE project. A research team consisting of a safety engineer, industrial hygienist and a physician visited the site of the fatality. Discussions were held with representatives of the Division of Occupational Safety and Health. Interviews were also conducted with the President of the Company, the job superintendent and a fellow worker who was in the excavation when it collapsed. Pictures, including video, 35 mm and polaroid, were taken of the accident site by the NIOSH team.

Synopsis of Events

At the time of the accident the victim was working in a manhole excavation measuring approximately 16' wide by 23' long by 21' deep. The excavation, which had been dug the morning of the accident, was at the terminus of a 5' wide trench, which had been excavated and backfilled about 3 weeks before. A sewer pipe, 2' in diameter, had been laid in this trench, and extended a few feet into the area of the new manhole excavation. The trench had been backfilled leaving a sloping ramp (approx. 35' in length) extending to the area of the manhole excavation. The open sewer trench had a 4' x 12' hydraulic shore installed about 8' to 10' from the intersection of the manhole excavation. No other shoring was in use. The victim, a lead man, entered the manhole excavation to remove loose material from the bottom corners so that a trench shield could be more easily installed. A laborer also entered the pit to assist. While the two men were in the pit, a train passed by on tracks about 43' from the edge of the pit. The laborer noted loose material falling from one corner where the trench intersected the manhole area. The men stepped back to consider the situation; they had noted movement at the

surface and were worried about a possible cave-in. In an attempt to exit the manhole area, the victim approached the trench ramp. As he stepped onto the sewer pipe he lost his footing and fell. He got up on the pipe a second time, and looked back to the other worker, joking about his fall. The other worker yelled a warning that the corner was falling in. The deceased tried to escape up the ramp but was swept backward across the pit and buried in a supine position with his feet toward the site of the cave-in. His co-worker scraped 6" to 8" of dirt off the deceased's face and found him to be alive and conscious. Other workers called the fire department for assistance and began digging the injured man out. Two fire squads responded. By the time the second unit arrived, the worker was almost completely extricated. He was removed from the pit by the rescue squad and supportive measures were instituted. Approximately 15-30 minutes later, he was evacuated by helicopter to a trauma center, but died during surgery approximately 6 hours later.

Conclusions/Recommendations

The following factors contributed to the accident:

1. No written company policy regarding safe work procedures regarding excavations.

2. Lack of use of available personnel protections for excavations.

3. Vibrations due to location of the excavation near a railroad track and major city street.

4. The procedure used by the site foreman to prepare the excavation for the trench shield.

5. The delay in the victim's escape when he fell trying to egress the excavation.

Recommendation #1: The company should have a written safety policy which delineates safety responsibilities and identifies safe work practices to be utilized in the performance of work. Since this company is involved in construction of pipelines, there should be written safe work practices specific to excavations which exceed 5' in depth. Additionally, the company should use observation techniques to assure field implementation.

Recommendation #2:

In accordance with the NBS-NIOSH publication "Development of Draft Construction Safety Standards for Excavations," the intersection of the trench and manhole excavation should either have been sloped to a safe angle or provided with adequate shoring devices. Furthermore, part of the excavation had been open for 3 weeks which allowed the soil to dehydrate and the excavation was within 43 feet of a railroad and 28 of a major city street. This increased the possibility of the soil to become more unstable due to vibration energy. The one hydraulic shore in the trench was not adequate for the entire excavated area.

Return to In-house FACE reports

Last Reviewed: November 18, 2015