



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



Construction Sub-contractor Asphyxiated in Manhole

FACE 8844

Introduction

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying: the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On August 20, 1988 a 26-year-old male construction worker died when he entered a manhole containing an oxygen deficient atmosphere and was asphyxiated.

Contacts/Activities

An industry association notified DSR of this fatality and requested technical assistance. A research safety specialist discussed this incident with the state medical examiner and, on September 22, 1988, met with local police and fire officials, the prime contractor who employed the victim, and photographed the incident site.

Overview of Employer's Safety Program

The victim in this incident was self-employed as a construction sub-contractor and had no formal safety program. The victim had eight years of experience in construction and had previously worked for the same prime contractor on projects similar to the one he was involved in at the time of his death.

Synopsis of Events

On the day of the incident the victim was involved in the construction of a new sewer system. Construction on this system had been underway for many months; however, the sewer system had not yet been connected to the existing system. The sewer lines being installed were 18-inch lines, with four-foot diameter concrete manholes, providing access to these lines, located at intervals along the sewer right-of-way. Ground water had been seeping into the sewer lines and small amounts of this water was present in both the lines and the manholes.

At the time of the incident the victim had been working as a sub-contractor in various manholes on this system for slightly over 4 hours. He told a co-worker that he was going to install a plug in the lines leading to the manhole where the incident occurred (to keep out the ground water) and that he would then meet the worker for lunch. The victim planned to pump the water out of the manhole after lunch and then construct a baffle in the manhole.

This manhole contained approximately one foot of water and 2-3 Inches of mud at the bottom. A wooden ladder had been left in the manhole since the time of construction but the manhole had not been opened since it was installed six months prior to the incident.

The victim parked his truck at the side of the manhole and left the door open and the motor running. He then removed the cover from the manhole and climbed down the ladder to install the plug. His co-worker, driving a tractor, arrived on the scene a few minutes later and saw the victim lying at the bottom of the manhole. The co-worker ran to a nearby home and telephoned for help.

The local fire department responded to the call and four firefighters were on the scene within four minutes. One of the firefighters immediately descended the ladder to check the victim for vital signs. As he reached the victim, he said he felt as though "someone had put a piece of cellophane over my face." The firefighter began climbing the ladder to escape from the manhole but he was extremely dizzy and had to be pulled from the manhole by two other firefighters.

Two other firefighters then descended the manhole wearing self-contained breathing apparatus(SCBA), put a rope around the victim, and had him hoisted from the manhole. Emergency medical technicians on the scene, unable to find vital signs, began cardiopulmonary resuscitation (CPR) on the victim and transported him to a local medical center. He was pronounced dead 1 hour and 10 minutes after the incident had been reported to the fire department.

Testing of the manhole by state Environmental Protection Agency employees on the day following the incident showed the following oxygen levels at various depths within the manhole:

- 5 feet below surface 20.5% oxygen
- 7 feet below surface 20.0% oxygen
- 9 feet below surface 14.0% oxygen
- 11 feet below surface 6.5% oxygen
- 13 feet below surface 4.0% oxygen

Cause of Death

The medical examiner gave the cause of death as asphyxiation.

Recommendations/Discussion

Recommendation #1: The atmosphere within a confined space should always be checked for oxygen content and the presence of toxic or flammable gases/vapors prior to entry.

Discussion: No attempt was made to check the atmosphere within this manhole prior to entry. Because work in similar nearby manholes had proceeded without problems, the victim apparently assumed that no hazards existed in the manhole where he died. Failure to check air quality within a confined space prior to entry is a common error which is observed in almost all confined space fatalities investigated by NIOSH. If confined space safe work procedures, as discussed in NIOSH Publication #87-113 "A Guide to Safety in Confined Spaces," had been followed, this death could have been prevented.

Recommendation #2: Confined spaces should never be entered without an observer posted outside and without use of appropriate rescue equipment (safety belt/harness and lifeline).

Discussion: In this incident the victim entered the confined space without an observer or safety equipment. An observer, outside of the confined space and equipped with appropriate rescue equipment, could have assisted the victim when he first lost consciousness, possibly preventing this death.

Recommendation #3: Contractors should ensure that all sub-contractors they employ have a safety program which addresses the hazards to which the sub-contractor's employees will be exposed.

Discussion: The prime contractor in this case had a company safety program which addressed work in confined spaces; however, no equivalent program was required for any sub-contractors employed at the work site. All employees at a work site should be trained and covered by a safety program addressing the specific hazards they will be exposed to. In this case, the victim apparently was unaware of the potential hazards with confined space entry.

[Return to In-house FACE reports](#)

Last Reviewed: November 18, 2015

Was this page helpful?

Yes

Partly

No