



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



City Water Worker Dies When Overcome by Natural Gas Vapors in a Confined Space in Ohio

FACE 8540

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. By scientifically collecting data from a sample of fatal accidents, it will be possible to identify and rank factors that influence the risk of fatal injuries for selected employees.

On July 1, 1985, an industrial motor reader employed by a mid-sized city in Ohio began his workday as usual at 7:30 a.m. He did not return to the garage at quitting time (4:00 p.m.) and was found face down in a motor vault at 6:45 p.m.

Contacts/Activities:

The Industrial Commission of Ohio contacted DSR and requested technical assistance in this confined space-related fatality. This case was included in the FACE Project. A research team (two safety specialists and a physician) visited the site of the fatality. A meeting was held at the Water Distribution Division facility. Those present at the meeting included the supervisor and manager of the Water Distribution Division, the foreman for industrial meter readers, legal counsel to the city, a union representative, the city safety officer, and a representative from the Industrial Commission of Ohio. Interviews were conducted with two workers with identical job classifications as the victim. The accident site was photographed by the NIOSH team.

Overview of Employer's Safety Program:

This city has a population of 235,000 and employs approximately 2500 permanent and temporary workers. There are six major departments, one of which is the Department of Public Service. The Department of Public Service has several Bureaus, including the Public Utilities Bureau. The Public Utilities Bureau has four divisions: Utility Services, Water Supply, Water Pollution Control, and Water Distribution. The victim was employed by the Water Distribution Division. This division employs 145 full-time and up to 25 seasonal workers. There are six industrial meter readers, two of which are assigned to reading motors at any one time. (Meter readers work individually.)

A deputy to the mayor is the designated safety officer and 90% of his time is spent handling labor relations and the remainder of his time is spent dealing with safety-related issues.

Synopsis of events:

On July 1, 1985, route assignments were received by the motor readers at 7:30 a.m. The victim (a 42 year-old meter reader) was assigned 76 accounts to be read that day. The victim had traded the original route assigned for a route with which he was unfamiliar. Industrial motors may be located in basements, at ground level, or in meter vaults and any one route may include all of these motor locations. The victim did not return to the garage at the usual quitting time of 4:00 p.m. This is not unusual because workers are occasionally late. At 5:00 p.m. when the victim still had not returned and he did not respond to dispatch calls, the police were notified. At 6:45 p.m. a passerby reported that the motor reader was down in a manhole and a fire rescue unit was dispatched to the accident site. The victim was found face down in the vault. The vault had approximately 4 1/2 inches of water in it. Resuscitation efforts were unsuccessful and the victim was pronounced dead at 9:31 p.m.

The victim had read 33 out of the 76 assigned motors when he reached the accident site. His supervisor felt that this should have taken until approximately 1:30 p.m. The victim was familiar with this vault, having seen it at the time of installation; however, this was the first reading this newly installed meter. The vault was installed in May of 1985 and was inspected for compliance with city regulations at that time. During this inspection, it was noted that the manhole cover did not have holes required for sufficient ventilation. The manhole cover was to be checked for compliance at this motor reading. No holes were present in the cover. According to the employee's supervisor, the victim may have had difficulty in removing the cover because the hook used to pull the lid open was straightened out and a sledge hammer was lying next to the manhole.

The vault (a two-piece, precast concrete structure – 15' x 9' x 8') contains large water lines and an industrial water meter. No other utility services use this vault. An investigation of the vault was undertaken by the local coroner's office. The investigation revealed a faint odor of natural gas. The local gas company was notified about a possible leak. It was later determined that a leak was present in a nearby line and the gas was then turned off. After the vault was determined safe for entry, the interior of the vault was inspected; however, no signs were present that indicated that the victim may have slipped or fallen. Since natural gas was suspected in this accident, the vault was further tested. On July 3, 1985, the gas line was turned on and the vault sealed. The atmosphere in the vault was periodically tested. It was eventually determined that (oxygen 17 Percent), (methane 15 Percent), and (carbon monoxide) (>600 parts per million) were present. On July 10, 1985, the gas line was excavated by hand. A leak was found at a coupling approximately 34 inches from the vault.

Cause of Death:

According to the coroner/pathologist, the cause of death was cardiovascular collapse due to acute myocardial ischemia due to inhalation of toxic fumes: "methane and carbon monoxide".

Recommendations/Discussion:

Recommendation #1: The city should develop and implement a comprehensive safety program. The Division of Water Distribution should have a documented safety program that identifies safe work practices to be followed. This program should include recognition of potential hazards.

Discussion: The city has no safety program and no written safety policy exists. Additionally, the Division of Water Distribution does not have a written safety policy or manual. Safety training is the responsibility of supervisory personnel and is limited to on-the-job training. The Division of Water Distribution is in the process of starting a new safety program for all employees consisting of four-hours of initial training and a monthly, one-hour follow-up. This course needs to be supplemented by a written safety manual.

Recommendation #2: The employer should develop comprehensive policies and procedures for confined space entry.

Discussion: All employees of the city who work in 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 minimally include:

1. Air quality testing to assure adequate oxygen supply, adequate ventilation, and the absence of all toxic air contaminants.
2. Employee and supervisory training in the selection and usage of respiratory equipment.
3. Development of site-specific working procedures and emergency access and egress plans.
4. Emergency rescue training.

Air quality was not tested prior to entry into the vault. Although oxygen/air quality monitoring devices are now provided for meter readers, training is necessary in proper usage and calibration of these devices. Respirators are now available for emergency use. Respirator training, fitting, and proper maintenance procedures should be completed by all personnel who may be required to use a respirator on the job. Medical evaluations of employees should be conducted to determine if they are physically able to perform the work while using a respirator. Immediate response to an emergency situation could prevent such fatalities. A full-time dispatcher is employed by the division. It would benefit the city to incorporate routine call-in procedures (indicating location, entrance time, and exit time) before confined space entry. (The employer should make full use of the resources they have available.) Guidance concerning proper procedures for confined space entry are discussed in DHEW NIOSH Publication No. 80-106, Working in Confined Spaces.

Recommendation #3: Vault manhole covers should have holes for ventilation.

Discussion: The Division of Water Distribution requires that manhole covers have holes for ventilation. The manhole cover at this accident site did not have the required holes. Although re-inspection was to take place at the time of this meter reading, this vault should not have passed inspection when initially installed and the victim should have been instructed not to enter the vault unless the proper manhole cover was in place.

Recommendation #4: Employers should assign employees tasks that are commensurate with their physical capabilities.

Discussion: The job of reading meters can involve strenuous physical activity. The victim had a history of medical problems. This medical history apparently was not taken into consideration when initially hired as a meter reader.

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