

# F.A.C.E. INVESTIGATION REPORT

## Fatality Assessment and Control Evaluation Project

FACE #94-NJ-086-01  
Construction Foreman Killed and Two Workers Injured  
When Exposed to Toxic Gases in a Sewage Pumping  
Station Dry Well



New Jersey Department of Health and Senior Services  
Occupational Disease and Injury Services  
P.O. Box 360  
Trenton, New Jersey 08625-0360  
(609) 984-1863

**TO:** Division of Safety Research  
National Institute for Occupational Safety and Health  
Morgantown, West Virginia

**FROM:** Fatality Assessment and Control Evaluation (FACE) Project  
New Jersey Department of Health (NJDOH)

**SUBJECT:** FACE Investigation #94-NJ-086-01  
Construction Foreman Killed and Two Workers Injured When  
Exposed To Toxic Gasses in a Sewage Pumping Station Dry Well

**DATE:** January 31, 1995

## **SUMMARY**

On June 14, 1994, a 32 year-old male construction foreman died and a laborer was critically injured after being exposed to toxic gases while working in a sewage pumping station dry well. Three workers had attempted to remove a blank that had been placed in a pipe to block the flow of sewage, causing trapped liquids and toxic gases to be released. Despite emergency treatment in hyperbaric chambers, the victim died of his injuries the next day and the second worker remained in critical condition. NJDOH FACE investigators concluded that, in order to prevent similar incidents in the future, these safety guidelines should be followed:

- o Employers should develop and implement a comprehensive confined space entry program.
- o Employers and employees should conduct a daily job hazard analysis of all work areas.
- o Contracting authorities should require contractors to specify how they will implement a safety and health program when bidding for a contract.

## **INTRODUCTION**

On June 17, 1994, NJDOH FACE personnel were informed of a confined space fatality by a NJDOH Service Director. After contacting the employer, FACE investigators interviewed the company owner and conducted a visit of the incident site on June 21, 1994. Due to potential hazards at the site, federal OSHA had closed the vault of the dry well. FACE staff photographed the site, without entering the space, and interviewed two witnesses (not employed by the company). A representative of the municipal utility authority (MUA), who contracted with the company, was also interviewed. Additional information was gathered from the OSHA investigation file, the County Hazardous Materials Emergency Response Unit report, police and newspaper articles.

The employer was a construction contractor who specialized in the installation and replacement of pipes and pumps, primarily in sewage treatment plants. The company had been in business for nine years and had fourteen employees. The present owners purchased the business two years prior to this incident but were with the company since its inception. The company had contracted with the municipality to perform renovations in three waste water pumping stations. They had worked on the pumping stations during the fall of 1993 and again in the spring, suspending work

during the winter.

In order to replace valves and pumps, they bypassed the pumping system and main sewer line by cutting a pipe that joined two sewer mains. They inserted a blank (a steel plate) into the cut pipe to block the flow of material through the pipe and bolted the blank in place. This was completed in March, 1994.

The company did not have a formal safety program but reported that they were implementing a confined space training program at the time of the incident. Four supervisors attended a five hour confined space seminar but they did not believe it directly pertained to their work. According to the company owner, the supervisors were to train other employees. None of work crew had been trained in confined space procedures. The workers were aware that when the alarm on their air monitor sounded, they were to leave the area.

Many of the company's employees did not speak English and received their instructions from a supervisor who spoke Spanish. The deceased victim was a 32 year-old male construction foreman who had worked for the company for nine years and had been a foreman for six years. His employer reported that he was relatively bilingual. His co-workers spoke little English. The critically injured worker was a 33 year-old laborer.

## **INVESTIGATION**

The incident occurred at a 30 year-old municipal sewage pumping station located in a suburban housing development. The station consisted of two large adjoining underground vaults separated by a concrete wall and covered by a brick utility building. One vault was a 19 foot deep wet well where sewage entering the station was collected and the second was a dry well containing the equipment to pump the sewage out of the wet well. The dry well was approximately 25 feet deep and was entered through an opening in the floor of the utility building. A ladder led down from the opening to a metal grate platform, 9 feet below ground, which in turn led to a second ladder to the bottom of the well. The pumps, pipes, and most of the valves were located at the bottom of the dry well. The wet well was a large vault containing sump pumps and was partly filled with effluent. It was entered through a hatch above the wet well which had a confined space warning painted on it.

The day of the incident was a hot and humid Tuesday with daytime temperatures in the 90's. During the morning, the crew set up their equipment on the lawn outside the pumping station and entered the pumping station to work. They worked in both the dry well and the wet well. They had with them a direct reading meter to monitor air levels of oxygen, carbon monoxide, sulfur dioxide and lower explosion level of gases. The crew consisted of a foreman (deceased), a pipe fitter, and a laborer (severely injured). At about 10 a.m., a worker for another company arrived to work on a generator in the back of the utility building. A township MUA worker was also on site to service the pumping station but was not present at the time of the incident. The crew worked through the day. They installed sump pumps to bypass the pumps in the dry well and connected them to the piping installed the previous October. A construction company supervisor worked with the crew from noon to around 5 p.m.. He wanted the crew to quit for the day but the three discussed the situation and decided to continue work to remove the blank in the line, which they thought would take about ½ hour. The supervisor left and the three entered the dry well. The laborer stayed on a platform about nine feet below ground so he could easily leave the area to obtain equipment and tools. The other two workers descended into the lower areas of the space. As they attempted to remove the blank, a section of it broke, leaving it still in the pipe. Liquids and gas in the pipe escaped from the opening. Because their meter was getting wet, the laborer moved it to an area out of the dry well. As they worked, the gas irritated the workers' eyes and they decided to go outside and use a hose to wash their faces. The pipe fitter and the laborer

went up the ladder and the foreman was to follow. When the two were outside, they heard the foreman yell for help. The two returned to the dry well to assist him. Seeing that the foreman had collapsed across a beam, the two climbed over a guardrail and were able to pull him on to the platform. They needed a rope to try to pull the victim up the ladder and the laborer started to climb up the ladder to get one out of their truck. He gasped and collapsed, falling backwards on the ladder. The pipe fitter then climbed up the ladder but was experiencing impaired coordination and weakness. He washed his head with water from the hose, used the building to steady himself, and managed to find the mechanic working in the back of the building to seek help.

The mechanic looked down the floor opening and saw the two unconscious construction workers. Recently trained in confined space procedures, he suspected toxic gas and told the worker to ask a neighbor to call 911 for help. He had to assist with the call to 911 because of the worker's limited ability to communicate in English. The worker wanted to re-enter the dry well to help his friends but the mechanic prevented him from doing so by giving him tasks to do such as moving the company trucks to make room for rescue teams. He also instructed him to wait by the road for the rescuers. The call to the police department was received at 6:15 p.m.. When the police, paramedics, and fire department arrived, the mechanic alerted them to the presence of gas. They entered the dry well wearing self-contained breathing apparatus (SCBA). The rescuers administered oxygen to the injured workers and pulled them out of the drywell with ropes. Cardio-pulmonary resuscitation (CPR) was started on both unconscious workers and they were taken by ambulance to area hospitals. From there they were transferred by ambulance to facilities for treatment in hyperbaric chambers. Despite these efforts, the victim died at 3:15 a.m. the following morning, about 10 hours after the incident. The laborer survived but remained in critical condition. The pipe fitter was treated at a local hospital and recovered from his exposure.

The county Hazardous Materials Emergency Response Unit responded to a 6:45 p.m. call for assistance and arrived at the site at approximately 7 p.m.. According to their report, the following reading, from a direct reading gas detection instrument, was recorded at 7:25 p.m. at the top of the vault of the dry well: sulfur dioxide (2.6 ppm), oxygen (20.4%), carbon monoxide (171 ppm), and a lower explosion level of 5 %. No information is available about detection of hydrogen sulfide levels. The levels of the gases at the time the workers were overcome is unknown.

## **CAUSE OF DEATH**

The county medical examiner attributed the cause of death to cerebral anoxic necrosis due to inhalation of toxic gases. The autopsy and toxicological reports were not available when this report was written.

## **RECOMMENDATIONS/DISCUSSIONS**

Recommendation #1: Employers should develop and implement a comprehensive confined space entry program.

Discussion: The value of confined space training can be seen in the mechanic's recognition of the situation, that he prevented the worker from reentering the well, and his ability to alert the rescuers. Unfortunately, the employees had not been trained in confined space procedures. A confined space training program should be presented to employees in their own language and should include:

- \* Recognition and marking of confined spaces
- \* Using a permit-entry system
- \* Having continuous air monitoring of the area
- \* Setting up ventilation for the area

- \* Creating a rescue procedure
- \* Personal Protective equipment

Had the workers been well trained in confined space hazards and entry, they may have been aware of the potential hazards in the sewer pumping station. Although they had a meter to monitor the air, they were not trained to recognize what the measurements indicated nor that it was important to monitor the air in their immediate work area. Noise from the sump pumps in the dry well may have obscured their ability to hear the sound of the monitor's alarm.

Additional information on the above can be found in the attached NIOSH publication "A Guide to Safety In Confined Spaces."

Recommendation #2: Employers and employees should conduct a job hazard analysis of all work areas.

Discussion: Due to the variety of hazards at sewage construction sites, it is recommended that contractors conduct a job hazard analysis of the work areas with their employees. A job hazard analysis should examine all work areas for confined space, fall, electrical, or other hazards the workers may encounter. After identifying any hazards, the employees should be instructed on how to correct or avoid them. A hazard analysis would have revealed that the area is a confined space, the possibility of hazardous gases in a sewage pumping station, and the possibility of releasing trapped hazardous gases.

Recommendation #3: Contracting authorities should require contractors to specify how they will implement a safety and health program when bidding for a contract.

Discussion: Contracting authorities (such as the municipality) should use health and safety language in their contracts that requires contractors and subcontractors to identify potential hazards when bidding for a job and specify how they intend to ensure employees' safety and health. The program should be acceptable with the contracting authorities and clearly state each party's responsibilities.

## **ATTACHMENTS**

A Guide to Safety In Confined Spaces. DHHS (NIOSH) Publication 87-113, NIOSH Publications Dissemination, Cincinnati OH (513) 533-8287.

NJDOH Information Bulletin: Sewerage Treatment Plant Health Hazards. New Jersey Department of Health, Public Employees Occupational Safety and Health Program, Trenton NJ.

## **REFERENCES**

Code of Federal Regulations 29 CFR 1926, 1992 edition. U.S. Government Printing Office, Office of the Federal Register, Washington DC.

It is important that employers obtain correct information about OSHA regulations and methods of ensuring safe working conditions. Because it is often difficult for a small business to obtain this type of information, the following sources may be helpful:

### U.S. Department of Labor, OSHA

On request, OSHA will provide information on safety standards and requirements for confined space precautions. OSHA has several offices in New Jersey which cover the following areas:

Hunterdon, Union, Middlesex, Warren and Somerset Counties....(908) 750-3270  
Essex, Sussex, Hudson and Morris Counties.....(201) 263-1003  
Bergen and Passaic Counties.....(201) 288-1700  
Atlantic, Gloucester, Burlington, Mercer, Camden, Monmouth,  
Cape May, Ocean, Cumberland and Salem Counties.....(609) 757-5181

NJDOL OSHA Consultative Services

The New Jersey Department of Labor OSHA Consultative Service will provide free advice for business owners on methods of improving health and safety in the workplace and complying to OSHA standards. Their telephone number is (609) 292-3922.

New Jersey State Safety Council

The NJ Safety Council provides a variety of courses on work-related safety. There is a charge for the seminars. Their address and telephone number is:

NJ State Safety Council  
6 Commerce Drive  
Cranford, New Jersey 07016  
Telephone (908) 272-7712

Other Sources

Labor unions, trade organizations, and qualified consultants may be a good source of information on suppliers of safety equipment and training.