**ADMINISTRATIVE REPORT** **DATE: October 15, 1999**
**PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR**
**FACE-99-02**



**TO:** **Director, National Institute for Occupational Safety and Health**

**FROM:** **Division of Safety Research, NIOSH**

**SUBJECT:** **Youth Dies in Trench Collapse Arizona**

## SUMMARY

A 17-year-old male laborer (the victim) died after one of the unprotected walls (no shoring, shielding or sloping) of the trench he was working in collapsed, striking him and covering him with soil. On the day of the incident, the employer, his sons, ages 17 and 10, and the victim were working on a sewer installation project on private property in an apartment complex. Shortly before the incident, the employer parked his backhoe next to the trench and left with his older son to get a backhoe with a smaller bucket. The victim remained in the trench leveling the soil in preparation for laying sewer pipe. The 10-year-old boy remained at the site to watch the victim and to be available to get help if anything went wrong. Shortly after his father left, the 10-year-old boy called several warnings to the victim as he saw soil caving in from the trench walls. Minutes later he called a warning when he saw a large section of trench wall breaking loose and beginning to fall. The section struck the victim before he had an opportunity to move and completely covered him. The boy called out to the victim several times and, hearing no response, ran to the apartment complex for help. One resident called 911, while a second ran to the trench. When the apartment residents arrived at the trench, they observed the soil pile at the bottom of the trench but could not see the victim. Realizing that the trench walls remained unstable and hazardous, they warned others to keep out of the trench and waited for the police who arrived approximately 3 minutes later. A police officer entered the trench and saw the victim through a 2 to 3-inch gap between the fallen section of earth and the trench wall. He was unable to detect any sound or movement from the victim. Police and Fire Department personnel, after evaluating the incident scene, determined that this was a body recovery operation, not emergency rescue. They summoned a specially trained Technical Rescue Team (TRT) from another fire department to direct recovery operations. The victim's body was recovered approximately 10.5 hours following the incident and taken to the local morgue for autopsy. NIOSH investigators concluded that, to prevent similar occurrences, employers should

- *know and comply with child labor laws which include prohibitions against work by youths less than 18 years of age in occupations which have been declared by the Secretary of Labor to be particularly hazardous (Hazardous Orders)*

- *ensure that workers are protected from cave-ins by an adequate protective system*

- *ensure that equipment is moved away from open trenches when not in use*

- *provide workers with adequate access and egress systems*

- *ensure that a competent person[1] conducts daily inspection of excavations, adjacent areas, and protective systems and takes appropriate measures necessary to protect workers*

- *provide workers with training in the recognition and avoidance of unsafe conditions and the required safe work practices that apply to their work environments*

*Additional note: Parents should discuss the type of work their children are performing and become familiar with the occupations which are prohibited for minors.*

**INTRODUCTION**

On February 27, 1999, a 17-year-old male laborer (the victim) died after one of the unprotected walls (no shoring, shielding or sloping) of the trench he was working in collapsed, striking him and covering him with soil. On March 1, 1999 officials of the Wage and Hour Division of the Department of Labor notified the Division of Safety Research (DSR) of this fatality and requested technical assistance. On March 31, 1999, a DSR occupational safety and health specialist conducted an investigation of the incident. The incident was reviewed with personnel from the State and Federal Wage and Hour Divisions, Arizona OSHA, law enforcement, city department of public works, and the medical examiner's office. The employer was not available for interview. The site was visited and photographs obtained during the investigation.

The employer was a construction contractor with approximately 23 years of experience in excavation-related activities. He had owned his own business for approximately 2 years and employed six full-time employees. On weekends he employed his sons and the victim.

[1]Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

The employer did not have a written safety plan nor did he provide employee training. The incident occurred on the victim's second weekend working at the site. This was the first fatality experienced by the employer.

During the course of the investigation, NIOSH investigators learned that three weeks prior to the fatality, the city's department of public works revoked the employer's work permit issued for excavation work within a public right-of-way, because of improper placement of barricades. After the barricades were properly placed the permit was reissued. Approximately 2 weeks later, the department of public works issued the employer a warning for unsafe trench conditions at the same site and ordered workers out of the trench until adequate protective systems were installed. Approximately 7 weeks following the fatal incident, the department of public works issued the employer another warning for unsafe trench conditions within the same public right-of-way worksite where warnings had been issued and again ordered workers out of the trench until protective systems were installed.

Since the fatal incident, the local fire jurisdiction has adopted an amendment to the procedures under which they operate (1991 Uniform Fire Code). The amendment directs firemen to remove workers from unsafe situations on private as well as public property when they identify conditions that are unsafe for workers according to regulations written by OSHA in CFR Title 29 Subpart P, standards 1926.650-652 (excavations).

**INVESTIGATION**

The employer was hired by the board of a private apartment complex to excavate a trench, install sewer pipe, and hook into the city sewer system. The employer was familiar with the site as he had worked for a company that had installed the original septic system for the apartment complex. On week-ends, the employer enlisted the help of his sons, ages 17 and 10, and his elder son's 17-year-old friend (the victim) to help complete the sewer project. The employer's full-time workers were not involved in any aspect of this project and work had been in progress for several weeks.

According to official reports, work began at approximately 7:30 a.m. on the morning of the incident and involved digging, leveling, and sloping the east end of the trench so that sewer pipe could be hooked into the city sewer system. The trench (see Top view Trench Diagram 1), which had been dug the weekend prior to the incident, measured 30-40 feet long from east to west, 3 feet wide at the west end and 5 feet wide at the east end. The victim was working at the east end where the trench depth was approximately 12 feet. No protective systems or ladders had been placed in the trench.

At approximately 11:30 a.m., the employer parked his backhoe next to the trench. He and his 17-year-old son then left the site for

another worksite where they were planning to pick up a backhoe with a smaller bucket which they needed to complete the east end of the trench. The victim remained in the trench working with a pick and shovel leveling the base of the east end of the trench. The 10-year-old boy was located outside of the trench so that he would be available if something went wrong.

Shortly after his father left, the 10-year-old boy called several warnings to the victim as he saw small chunks of soil caving in from the trench walls. Minutes later he called a warning when he saw a large section of trench wall breaking loose from the north wall and beginning to fall. The section struck the victim before he had an opportunity to move and completely covered him.

The boy called out to the victim several times and, hearing no response, ran to the apartment complex for help. He made contact with two apartment residents, and while one called 911 (dispatch received the call at 12:04 p.m.), the other resident ran with the boy to the trench to see what had happened.

When the apartment residents arrived at the trench, they observed the soil pile at the bottom of the trench but could not see the victim. Realizing that the trench walls remained unstable and hazardous, they warned others to keep out of the trench and waited for the police who arrived on the scene at 12:06 p.m.

A police officer immediately entered the trench from the west end. He saw the victim through a 2 to 3-inch gap between the fallen section of earth and the south wall of the trench but was unable to detect sound or movement. The section of soil that had fallen from the north wall of the trench and onto the victim measured approximately 5 feet long by 3 feet wide by 12 feet deep (See Top View Trench Diagram 1). The backhoe used to dig the trench was parked above the north wall of the trench and its left outrigger and left tire extended to the north edge of the trench where the soil had broken loose. Additional downward pressure on the soil from the backhoe's weight combined with unstable soil due to a previously installed gas line located approximately 5 feet beneath the backhoe, may have contributed to the trench collapse.

The Police and Fire Department personnel determined that this was a body recovery operation, not emergency rescue. They summoned a specially trained Technical Rescue Team (TRT) from another fire department to direct the recovery operations. The TRT arrived at 12:35 p.m., and performed a site assessment. They proceeded to direct sloping of the trench walls and installation of shores, facilitated gas line shut off and structural support, performed air monitoring, and obtained additional excavation equipment needed to complete the recovery. The victim's body was recovered approximately 10.5 hours following the incident and was transported to the local morgue where an autopsy was performed.

**CAUSE OF DEATH:**

The Medical Examiner listed the cause of death as blunt force trauma.

**RECOMMENDATIONS/DISCUSSION**

*Recommendation #1: Employers should know and comply with child labor laws which include prohibitions against work by youths less than 18 years of age in occupations which have been declared by the Secretary of Labor to be particularly hazardous (Hazardous Orders).*

Discussion: The Fair labor Standards Act provides a minimum age of 18 years for work which the Secretary of Labor declares to be particularly hazardous (Hazardous Orders). One of the 17 Hazardous Orders prohibits minors from some types of work in excavation operations. (Hazardous Order N0.17). With regard to trench work, this order prohibits the employment of persons less than 18 years of age from excavating, working in, or backfilling trenches that are 4 feet deep or greater at any point. Employers who employ workers less than 18 years of age, should contact the U.S. Department of Labor Wage and Hour Division and the agency in their State that regulates child labor to obtain information regarding appropriate work assignments for young workers.

*Recommendation #2: Employers should ensure that workers are protected from cave-ins by an adequate protective system.*

Discussion: 29 CFR 1926.652 (a) (1) states that "each employee in an excavation shall be protected from cave-ins by an adequate protective system." A protective system designed for the soil conditions found in this excavation could have included a trench shield (also known as a trench box), shoring, or a combination of shoring and shielding. Sloping would not have been appropriate because the soil had been previously disturbed to place the gas line and the original septic system. Employers should consult tables in the appendices of the OSHA Excavation Standard that detail what is required depending upon the type of soil and environmental conditions present at the site. Employers can consult with manufacturers of protective systems to obtain detailed guidance for the appropriate use of these products. In this incident, no protective system had been placed at any point in the 30-40 foot trench. The employer had a protective system available at another worksite but for unknown reasons failed to use a protective system at the incident site.

*Recommendation #3: Employers should ensure that equipment is moved away from open trenches when not in use.*

Discussion: Employers should park their equipment well away from the trench when equipment is not in use. When digging is performed, workers should be removed from the trench. The weight

of equipment places additional stress on trench walls and can contribute to trench collapse. In this instance, the weight of the backhoe, its placement on previously dug soil, and the placement of the outrigger up to the edge of the trench wall may have contributed to the trench wall collapse.

*Recommendation #4: Employers should provide workers with adequate access and egress systems*

Discussion: 29 CFR 1926.651 (c)(1)(i) and (v) respectively, require that a competent person design ramps for use in trench access and egress so that workers can use them without slipping or tripping. 29 CFR 1926.651 (c)(2) states that " a stairway, ladder, ramp or otherwise safe means of egress shall be located in trench excavations that are 4 feet (1.22m) or more in depth so as to require no more that 25 feet(7.62m) of lateral travel for employees." No ladders or other safe means of egress were available within 25 feet of the victim.

*Recommendation #5: Employers should ensure that a competent person conducts daily inspection of excavations, adjacent areas, and protective systems and takes appropriate measures necessary to protect workers*

Discussion: 29 CFR 1926.651 (k) (1) requires that "daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift." 29 CFR 1926.651 (k) (2) requires that "where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety." Were the duties of the competent person for inspections carried out according to OSHA regulations, unsafe conditions may have been recognized and the worker may have been removed from the trench until necessary safety precautions had been taken.

*Recommendation #6: Employers should provide workers with training in the recognition and avoidance of unsafe conditions and the required safe work practices that apply to their work environments.*

Discussion: According to 29 CFR 1926.21 (b)(2), "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to injury or illness." Youth less than 18 years of age should receive training on prohibited work tasks and settings (activities deemed to be

especially dangerous for youth by the employer and/or child labor regulations), as well as hazards and safe work practices that apply to work they are permitted to perform. Training in recognizing and avoiding hazards should be given to all workers; coupled with employer assessments that workers are competent in the recognition of hazards and safe work practices.

*Additional note: Parents should discuss the type of work their children are performing and become familiar with the occupations which are prohibited for minors.*

Discussion: Parents may be unaware of the type of work performed by their minor children and unaware of the occupations which the Secretary of Labor has deemed hazardous and not permitted for minors. In this incident, the parents knew their child was working in construction. However, they reported they were not aware of the type of construction work he was doing. The child's father reported that he was familiar with trenching and would have cautioned his son about the dangers of being inside an unprotected trench, had he known. Had the parents known the work their son was performing and had they known it was considered hazardous and thus prohibited by law, they might have advised him against doing this type of work.

**REFERENCES**

29 CFR 1926 (1998) Code of Federal Regulations, Washington D.C.: U.S. Government Printing Office, Office of the Federal Register

DOL (1990b). Child labor requirements in nonagricultural occupations under the Fair Labor Standards Act. Washington D.C.: U.S. Department of Labor, Employment Standards Administration, Wage and Hour Division WH 1330.

Doloris N. Higgins
Occupational Safety and
Health Specialist
Fatality Assessment and
Control Evaluation Team
Surveillance and Field
Investigations Branch
Division of Safety Research

Virgil J. Casini
Team Leader
Fatality Assessment and Control
Evaluation Team
Surveillance and Field
Investigations Branch
Division of Safety Research

Dawn N. Castillo
Chief
Surveillance and Field
Investigations Branch
Division of Safety Research

Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when technical assistance is requested from participating states or the Wage and Hour Division, Department of Labor. 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.

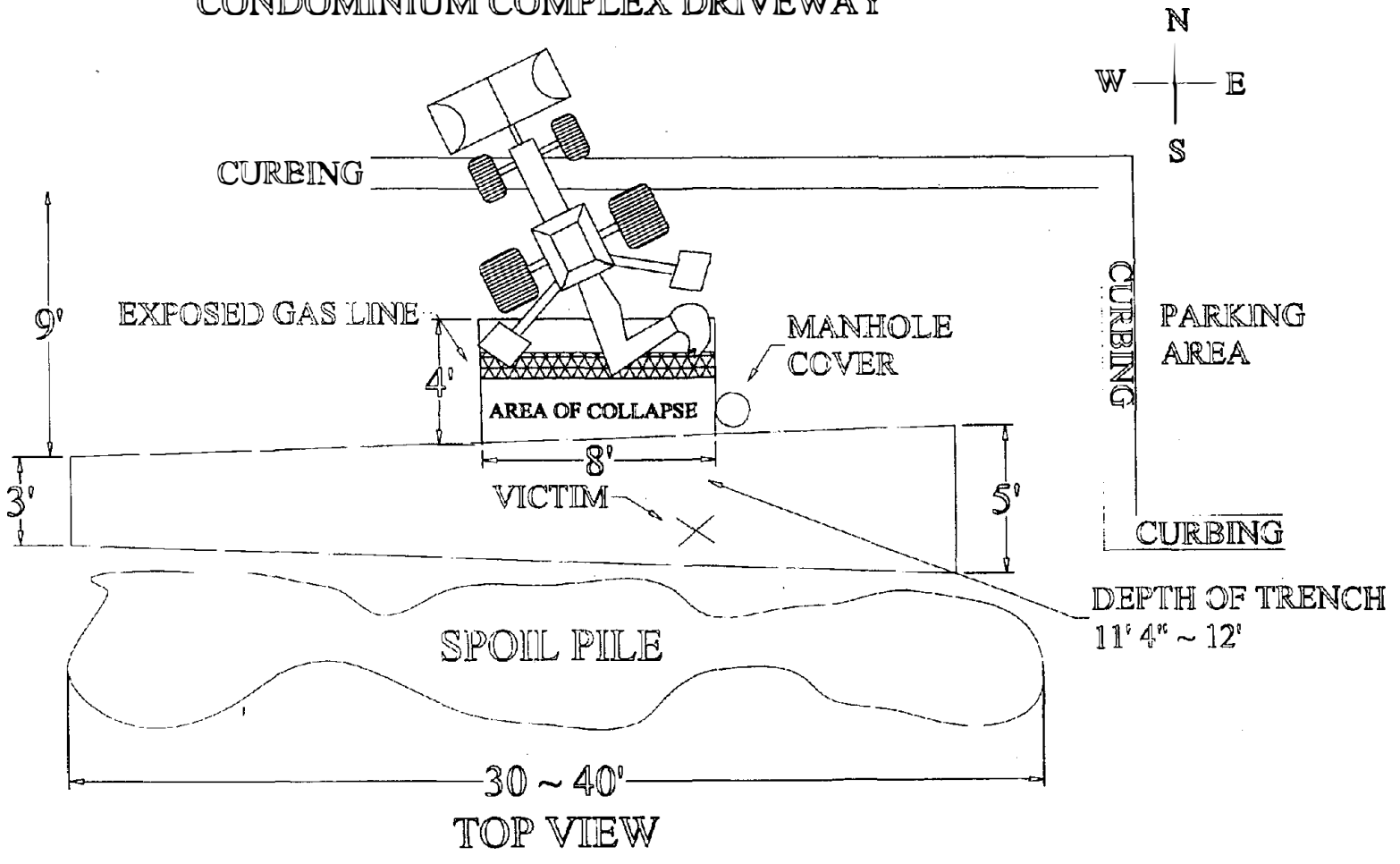
States participating in this study: North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia.

Division of Safety Research
National Institute for Occupational
Safety and Health (NIOSH)
1095 Willowdale Road
Morgantown, West Virginia 26505-2888
Phone: (304) 285-5916
FACE 99-02

# TRENCH TOP VIEW DIAGRAM 1

## FACE 9902

## CONDOMINIUM COMPLEX DRIVEWAY




TOP VIEW

**MEASUREMENTS ARE APPROXIMATE**