MIFACE INVESTIGATION: 05MI084

SUBJECT: Worker Dies in Trench Collapse

SUMMARY

On Friday, August 19, 2005, at approximately 12:00 p.m., a 24-year-old worker died when he was buried under a wall of the trench he was working in (Figure 1). The excavation wall and part of the sidewalk next to the concrete garage floor collapsed onto him while he was attempting to attach the new PVC pipe he and his coworkers had installed that morning to the main sewer in the alley. One of the decedent's coworkers was also caught in the collapse. Two other workers on-site, neighbors who heard their calls for help, and firefighters who arrived on the scene were able to extricate the decedent's coworker (the company owner) from the excavation. He was transported to a hospital and recovered. The decedent's body was recovered from the excavation approximately 8 hours after the wall collapsed.

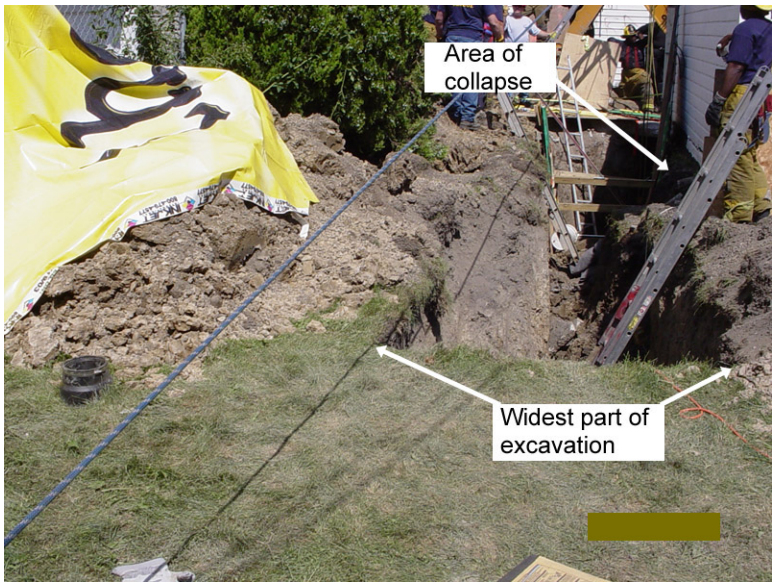

Figure 1. View of excavation from west to east showing widest part, area of collapse, vertical sides and spoils.

RECOMMENDATIONS

- Employers and self-employed contractors should slope or shore or use trench boxes in all excavations greater than 5 feet deep.
- Employers and self-employed contractors should ensure that excavations are inspected by a competent person prior to start of work and as needed throughout a shift to look for evidence of any situation that could result in possible cave-in.
- Employers and self-employed contractors should design, develop, and implement a comprehensive safety program that includes training in hazard recognition and avoiding unsafe conditions.

Keywords: Excavation, Trench, Other

- Emergency medical services and fire-rescue personnel should be knowledgeable about proper rescue techniques involving excavation sites and ensure that adequate shoring equipment is on hand at all times.

INTRODUCTION

On Friday, August 19, 2005, at approximately 12:00 p.m., a 24-year-old worker died when he was buried under a wall of the trench he was working in. The wall and part of the sidewalk next to the concrete garage floor collapsed onto him while he was attempting to attach the new PVC pipe he and his coworkers had installed that morning to the main sewer in the alley. On August 19, 2005, MIFACE investigators were informed of the fatality by the Michigan Occupational Safety and Health Act (MIOSHA) personnel who had received a report on their 24 hour-a-day hotline that a work-related serious injury had occurred. On December 9, 2005, the MIFACE researcher interviewed the company owner (the father of the decedent) who was the coworker who had been extricated from the excavation and recovered. During the writing of the report, the medical examiner's report, photographs taken by the MIOSHA officer at the incident site, and the MIOSHA file and citations were reviewed. The figures and diagrams included in the report are courtesy of the MIOSHA investigating officer.

The owner of the company was self-employed and had been doing sewer work for about eight years on his own. He was not a licensed plumber or contractor. He had started to work on his own after he was laid off from a maintenance job he had worked at for 19 years for a large public school district. His job title when he worked for the maintenance department was sewer maintenance. He described this job as unstopping sewers, digging up and repairing sewers, and exposing water mains for the plumbers to fix.

The decedent had worked for his father's company for approximately 7 years. The company had no safety training program. According to the owner, he taught his employees (his sons) on-the-job what he had learned on-the-job and had been doing for his 19 years as a sewer maintenance worker. When he had worked for the school district maintenance department, he indicated he had never used a trench box. Their method of working was "get in, fix it, get out." He also indicated that during an excavation, someone was stationed at the top to watch the dirt. The lookout would look for cracks and slow-moving or shifting dirt. If the lookout saw these signs, he would shout something like, "Dirt is coming". At that warning the workers in the trench were to stand up and put their hands in the air.

The MIOSHA investigation resulted in three Serious violations being issued to the company:
General Rules, Part 1, Rule 114(1) The employer had no safety program.
Excavation, Trenching and Shoring, Part 9, Rule 933(2) Excavated and other material must be stored no less than 2 feet from the excavation edge.
Excavation, Trenching and Shoring, Part 9, Rule 941(1) The sides of an excavation greater than 5 feet deep shall be sloped unless otherwise supported. The sides of the excavation were not sloped; there was no shoring; and no trench box was used.

INVESTIGATION

The project the company was doing for the owner of the home where the incident occurred consisted of installing new sewer piping from about 15 feet from the house to the main sewer connection. The existing pipe was leaking somewhere under the garage in this area. The 4-man crew consisting of the company owner, two employees (his sons), and the backhoe owner and operator had begun digging at the site that morning at about 8:00 a.m.

The trench that had been dug from near the back of the house to the sewer main was approximately 30 feet long. It was approximately 5-feet wide at the beginning near the house. When the excavation reached the garage, it narrowed from 5 feet to 3-1/2 feet and continued at this width to the alley. The initial depth near the house was approximately 6 feet and the trench slanted down toward the sewer main to approximately 9-1/2 feet deep (Diagram 1). The sides of the trench were close to vertical.

According to the company owner, the size of the yard and proximity of a fence did not allow for the excavated soil to be piled away from the trench, so it was piled up on the edges of both sides of the trench. Also, he indicated that the congested area did not allow room for the trench to be sloped and shoring would have been too costly and taken too long.

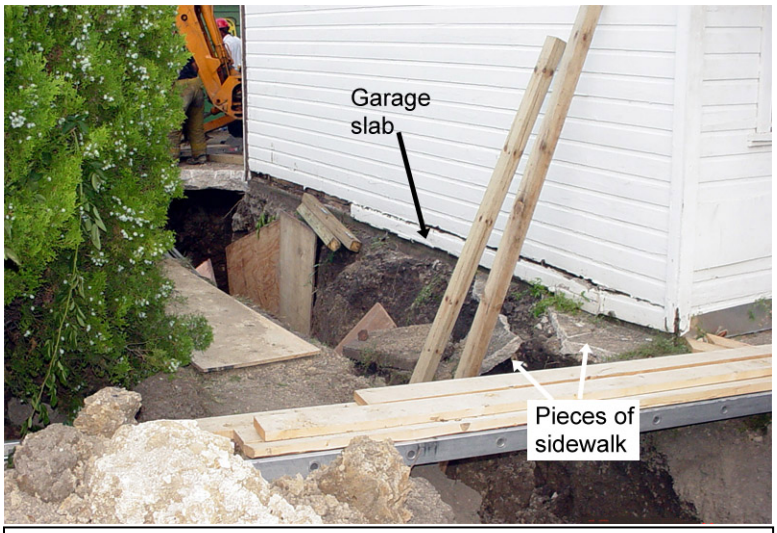

Figure 2. Pieces of sidewalk in collapsed area and garage slab separated from foundation.

The company owner and decedent were both working in the trench when it collapsed about four hours after they had started the job. An employee (the second son) was standing outside the trench handing down pipes and watching for cracks, slow-moving or shifting dirt. They had installed three 10-foot sections of 6-inch diameter PVC pipe. The decedent was attempting to attach the last section of pipe with a 45 degree elbow before tying into the sanitary sewer in the alley when the collapse occurred. The employee outside the trench saw the dirt start to collapse and yelled something like, “Dirt.” The company owner, who was standing several feet away from the decedent toward the house where the trench was approximately 7-feet deep, stood up (Diagram 2). He was buried to his chest, but he was able to be extricated by neighbors and first responders. The

decedent, bent over tying the pipe to the main in tight quarters where the trench was 9-1/2 feet deep, was completely buried (Diagram 3).

The broken sewer line under the garage had been leaking water and saturating the soil under the garage floor for several months before the day of the incident. The trench wall area that collapsed was where the water had been leaking from the old, broken sewer line under the garage. Approximately 20 feet of water-saturated dirt 24 to 30 inches wide and a 4-inch thick concrete sidewalk running directly next to and the full length of the garage collapsed into the trench (Figure 2). The garage slab tilted toward the cave-in.

First responders used sections of neighbors' picket fences and 4-foot by 4-foot posts to create temporary shoring to rescue the company owner. Because the trench sides were still unstable, they waited for responders with the appropriate excavation shoring equipment (Figure 3). The body of the decedent was recovered approximately 8 hours later.

Figure 3. Shoring installation

CAUSE OF DEATH

The cause of death as stated on the medical examiner's report was traumatic asphyxia as a result of a trench collapse. The results of the toxicology tests for alcohol and drugs were negative.

RECOMMENDATIONS/DISCUSSION

- Employers and self-employed contractors should slope or shore or use trench boxes in all excavations greater than 5 feet deep.

MIOSHA Part 9, Rule 941(1) Excavation, Trenching and Shoring requires that any trench greater than 5 feet deep which may be entered by a worker be sloped or shored in order to prevent cave-in. Shoring may be accomplished by the use of trench boxes or by construction of an adequate structure. Because of the limited space available for sloping the sides of the trench in this backyard, the use of a trench box might have prevented this fatality.

- Employers and self-employed contractors should ensure that excavations are inspected by a qualified person prior to start of work and as needed throughout a shift to look for evidence of any situation that could result in possible cave-in.

A qualified person means a person who by possession of a recognized degree or certificate of professional standing or who by extensive knowledge, training and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

A qualified person 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. A qualified person would have had:

1. A method for determining the soil type and conditions (leaking sewers, heavy rains, etc.). This would mean training on soils, use of either field testing methods or a penetrometer.

2. Identified that in a confined excavation area there needs to be shoring.

3. Given consideration to nearby structure/s that can affect the excavation stability or be affected by the excavation.

4. Not permitted employees to enter the excavation until it was safe to.

The conditions and the directions given to the employees were not consistent with those of a qualified person demonstrating adequate knowledge about safe work practices in excavation techniques. The company owner and his employees recognized that there are hazards associated with working in the trench, because one employee was assigned to constantly look for shifting or moving earth. The company owner indicated to the MIFACE investigator that it was "fate" that his son had died. He said it could as well have been himself. Unfortunately, they accepted the risks of not adequately shoring the excavation nor using a trench box, and a person died. The company owner indicated at the time of the interview that he had not done any excavation work since the fatality, and he did not know if he would do any again.

The MIOSHA Consultation, Education and Training (CET) Division presents many health and safety courses, including excavation safety. These courses are held at various locations across the State. MIFACE encourages persons doing excavation work to contact the MIOSHA CET Division to learn about the course schedule and locations. The MIOSHA CET Division website can be accessed through the Michigan Department of Labor and Economic Growth website at www.michigan.gov/cis/ <http://www.michigan.gov/cis/>. Click on the MIOSHA link located in the box on the left side of the web page, then click on the Consultation, Education, and Training link. MIOSHA CET can also be contacted by telephone: (517) 322-1809.

- Employers and self-employed contractors should design, develop, and implement a comprehensive safety program that includes training in hazard recognition and avoiding unsafe conditions.

Employers and self-employed contractors should be aware of and recognize their knowledge limitations and seek advice, assistance, consultation, and specific training as necessary. MIOSHA R408.40114(2)(d) requires that the employer have an accident prevention program that provides instruction to each employee in the recognition and avoidance of hazards. A comprehensive safety program should address all aspects of safety related to specific tasks that employees are required to perform. Safety rules, regulations, and procedures should include the recognition and elimination of hazards associated with tasks performed by employees.

- Emergency medical services and fire-rescue personnel should be knowledgeable about proper rescue techniques involving excavation sites and ensure that adequate shoring equipment is on hand at all times.

Untrained coworkers (neighbors) and first responders using inadequate materials (picket fence sections) uncovered and removed one victim from the trench before trained rescue personnel with the proper equipment arrived at the scene. Workers should never, under any circumstances, enter a hazardous environment to attempt a rescue operation unless properly equipped and trained in the use of the equipment and methods required for rescue. In this instance, untrained workers entered the trench, uncovered one of the victims and removed him from the trench, placing themselves at risk of becoming victims.

Also, it was pointed out to them that the spoils were still too close to the excavation when they were installing shoring. Only those persons trained in the requirements of NFPA 1670 should attempt rescue operations after a trench cave-in occurs. All persons at the incident site should follow the directions given by the Incident Commander or his/her designee in order to provide the most optimal circumstances for the safety of all persons on the site during rescue operations. Rescue attempts should be discontinued when rescue personnel are placed in imminent and immediately dangerous situations until proper shoring of excavations can be accomplished.

REFERENCES

1. MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Labor and Economic Growth (DLEG) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Labor and Economic Growth, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

2. NFPA [1999]. NFPA 1670, Standard on operations and training for technical rescue incidents 1999 Edition, Chapter nine, trench and excavation. Quincy, MA; National Fire Protection Association.

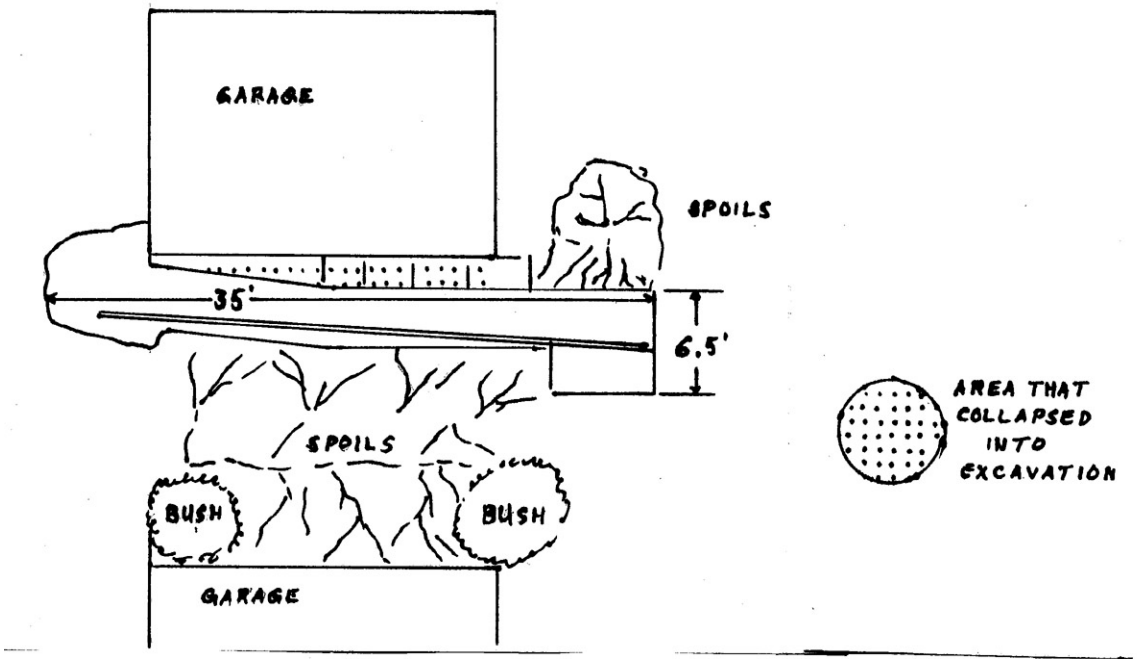

Diagram 1

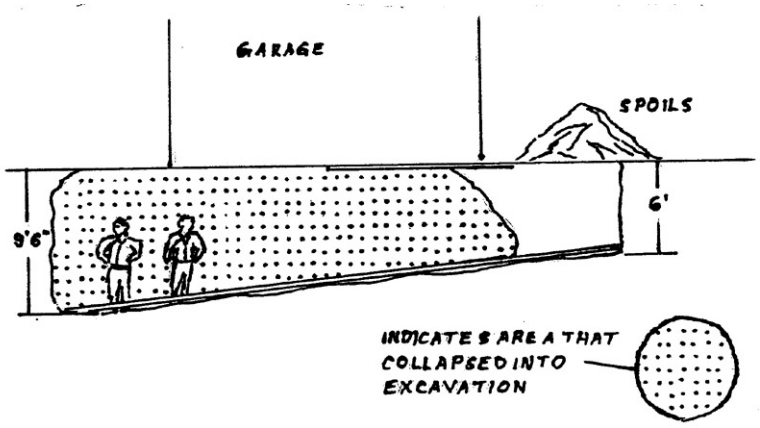

Diagram 2

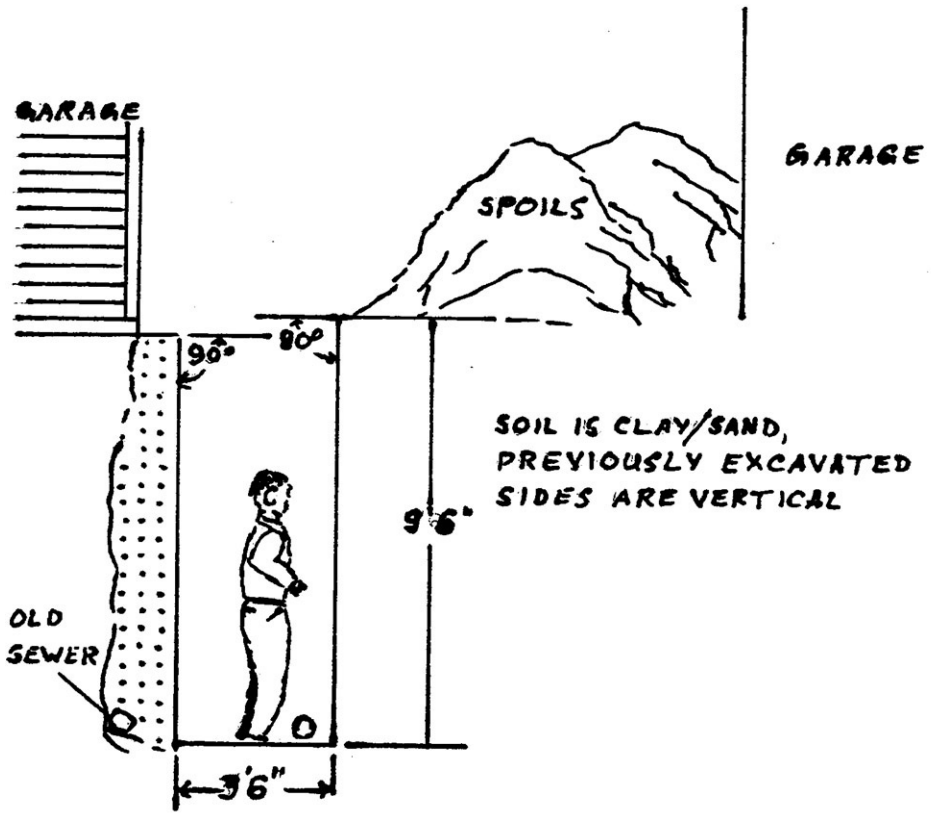
GARAGE
SPOILS
GARAGE
90°
90°
SOIL IS CLAY/SAND,
PREVIOUSLY EXCAVATED
SIDES ARE VERTICAL
9'6"
OLD
SEWER
3'6"

Diagram 3