# MICHIGAN

## MICHIGAN STATE UNIVERSITY: Prevention of work-related injuries & illnesses through research & investigation

### TRENCH WALL COLLAPSES DO KILL

Hazard Alert Trench Collapse 6/6/19

From 2001-2018, 30 workers have died while working in a trench, 20 of whom died when the trench wall collapsed and buried the worker. MIOSHA defines a trench as an excavation (any man-made cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal) having a depth greater than its width measured at the bottom. Worker deaths in trenches have also been caused by electrocution, asphyxiation, drowning, and being struck by objects (such as an excavator bucket, geofoam block, water tank, and backhoe).

### WORK-RELATED FATALITIES NARRATIVES EXAMPLES TRENCH WALL COLLAPSE IN MICHIGAN

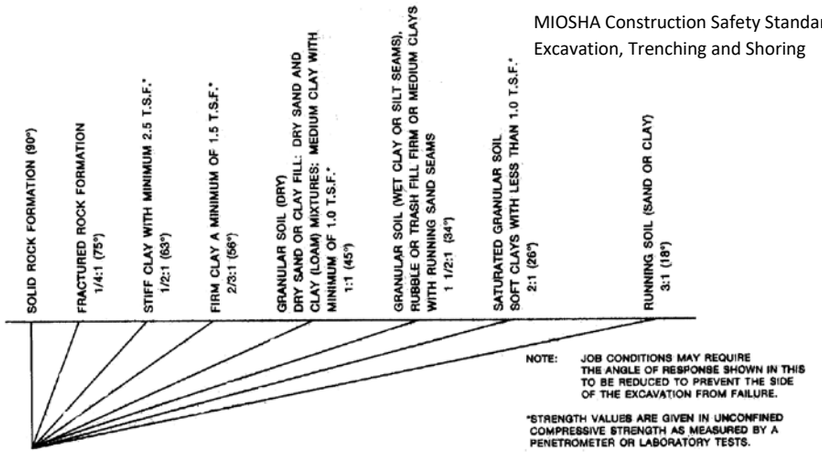
- 18-year-old male carpenter was killed when the wall of a 52-foot long and 10-foot deep trench collapsed and buried him. The decedent was a member of a work crew installing a four-inch sewer line to a new residence.
- 24-year-old male construction worker was buried when the wall of a 50-foot long, 2-foot wide, and 6-foot deep trench collapsed onto him. Due to a recent rainfall the soil was wet. The eastern and western sides of the excavation were close to vertical. He and fellow crewmembers were attempting to maneuver a section of water pipe under two PVC pipes at the bottom of the excavation when the wall failed.
- 41-year-old male worker was killed when the nearly vertical sides of the 8-foot deep and 4½-foot wide trench collapsed onto him and a fellow worker. The two men were laying sewer pipe. The workers' employer was operating a backhoe to dig the trench and placing the spoils along one edge of the excavation. Prior to the fatal collapse, the two workers had to run to avoid being buried by another cave-in.
- 39-year-old male laborer was killed when north, east and west walls of a 29-foot long, 9-foot deep, 7-foot wade at the base and 6-foot wide at the ground level collapsed and buried him. The north, east and west walls of the trench were undercut and nearly vertical; the south wall of the trench was sloped at approximately $70^0$. The decedent had been hired to perform a sewer cap-off in preparation for a building demolition. The decedent was hand digging around the sewer line in preparation to cut the pipe, approximately 10 feet from the south edge of the trench. The decedent mentioned to the employer, who had just arrived and was standing on the ground at the edge of the trench, that the dirt kept collapsing around him and the pipe. Shortly thereafter, the east, west and north walls of the excavation collapsed on top of the decedent. The employer jumped in the trench and started digging by hand to try to uncover the employee.
- A 30-year-old male laborer died when the wall of 70-foot long, 7-to 8-foot deep, 3- to 4-foot wide at the base trench collapsed and buried him. The decedent and the company owner were locating clogged sewer pipe. The west wall was at a 74º angle. The east wall of the excavation, right next to the driveway, was nearly vertical. The two workers went into the excavation to hand dig to attempt to find the plugged areas and clean out or replace the sewer. While in the excavation, the wall next to the driveway (east wall) collapsed, completely burying the decedent and burying the company owner to his waist.

## PREVENTING WORK-RELATED FATALITIES FROM TRENCH WALL COLLAPSE

- **Designate** a qualified person (QP). A qualified person is one 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.
- **Locate** underground utilities.
- **Identify** soil type and **Evaluate** soil conditions. See OSHA Excavations in Construction Prevention Video (V-tool): Soil Classification.
- **Require appropriate protective system for excavations with at least one side over 5 feet in depth based on soil type and condition. An excavation less than 5 feet in depth must be effectively protected when hazardous earth movement may be expected.** There are different types of protective systems. **Sloping (angle of repose)** involves cutting back the trench wall at an angle inclined away from the excavation. **Shoring** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins. **Shielding** protects workers by using trench boxes or other types of supports to prevent soil cave-ins.
  - ✓ **Modular Trench Box systems** can be purchased or rented. Many manufacturers design the system components to be carried in personal pickup trucks, be assembled on-site and lowered into the trench using smaller scale equipment.
  - ✓ **Extend** trench box at least 18" above top of trench if trench is to be sloped above the box.
- **Follow General Trenching and Excavation Rules**
  - ✓ Place surcharge loads at least 2 feet away from trench edge. Spoils and heavy equipment are examples of a surcharge load.
  - ✓ Know where underground utilities are located.
  - ✓ Test for low oxygen, hazardous fumes and toxic gases, especially if working near underground gas lines, storage tanks or using fossil fuel powered equipment.
  - ✓ Inspect trenches daily and/or at the start of each shift.
  - ✓ Inspect trenches following a rainstorm.
  - ✓ Provide appropriate protections if water accumulation is a problem
  - ✓ Do not work under raised loads.
  - ✓ Use a ladder or other means of exit at least every 25 feet of an excavation at least 4 feet in depth.


TABLE 1
MAXIMUM ALLOWABLE ANGLE OF REPOSE FOR THE SIDE OF AN EXCAVATION IN EXCESS OF 5' DEPTH

MIOSHA Construction Safety Standard Part 9, Excavation, Trenching and Shoring




### DID YOU KNOW?

- The fatality rate for excavation work is 112% higher than the rate for general construction.
- The appropriate protective system depends upon soil classification, depth of cut, water content of soil, weather- or climate-driven changes, surcharge loads, and other nearby operations.
- A surcharge load is any load which is imposed upon the surface of the soil close enough to the excavation to cause a lateral pressure to act on the system in addition to the basic earth pressure.

### Resources

MIFACE: www.oem.msu.edu

NIOSH FACE: www.cdc.gov/niosh/face/

MIOSHA Excavation and Trenching Resource Page. www.michigan.gov/lara/0,4601,7-154-89334_11407_15317-483898--,00.html

OSHA Resources

- Construction eTool: Trenching & Excavation: www.osha.gov/SLTC/etools/construction/
- Safety and Health Topic: Excavation and Trenching. https://www.osha.gov/SLTC/trenchingexcavation/index.html