Trenching and Excavation Safety
FACT SHEET

LENGTH: 13 MINUTES **Production Year: 2023**

PROGRAM SYNOPSIS:
Trenches and excavations pose a serious and sometimes fatal threat to the safety of workers. There are dangerous risks and hazards that come with working in and around excavations. Trenches can be especially treacherous. However, by following the proper safety protocols for trenching and excavation work, the risk of experiencing an incident or injury in or around trenches and excavations can be reduced. This program details ways workers can protect themselves from cave-ins and other hazards when working with trenches and excavations.

PROGRAM OBJECTIVES:
After watching the program, the participant should be able to explain the following:
- What is a cave-in;
- Who is the "competent" person;
- The different soil types;
- Protective systems used around trenches and excavations;
- General hazards around excavations, including struck-by hazards from equipment.

PROGRAM OUTLINE:
INTRODUCTION
- Excavations pose a serious and sometimes fatal threat to the safety of workers. There are serious risks and hazards that come with working in and around excavations. Trenches in particular can be especially dangerous.
- A trench is defined as a narrow excavation, made below the surface of the ground, where the depth is greater than the width.
- By following the proper safety protocols for trenching and excavation work, you can reduce your risk of experiencing an incident or injury in or around trenches and excavations.

CAVE-INS
- There are several risks and hazards associated with trenches, but the primary hazard is injury or death from a cave-in or trench collapse.
- Every trench or excavation is made up of many cubic yards of dirt. On average, each cubic yard of dirt weighs well over 2,000 pounds. During the collapse of a trench wall, many cubic yards of dirt will quickly fall into the trench, and the extreme weight of all that dirt will crush anything and anyone in its path.
- Throughout this training, we will review some of the ways you can protect yourself from a cave-in. We'll also discuss some of the other hazards that come with trenching and excavation work. The strategies covered in this training just might save your life.

COMPETENT PERSON
- Before workers enter a trench, a competent person must ensure the trench is safe to enter.
- OSHA defines a competent person as an individual who is capable of identifying existing and predictable hazards and who is authorized to take prompt corrective measures to eliminate them. This might be a company's engineer, safety manager, or a trained supervisor.
- One of the duties of a competent person is to determine the type of soil in which the excavation will occur. This can be achieved through a soil analysis.
- A soil analysis can be performed in the field using a pocket penetrometer, by thumb penetration tests, or through other methods.

SOIL TYPES
- Generally speaking, there are three types of soils, and they are categorized based on stability. Other than stable rock, Type A soil is the most stable, followed by Type B soil. The least stable soil type is Type C soil.

- Examples of Type A soil include clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam.
- However, no soil can be classified as Type A if the soil is fissured; if the soil has been previously disturbed; if the soil is subjected to vibration from heavy traffic, pile driving, or similar effects.
- Type B soils often include angular gravel (similar to crushed rock), dry rock that is not stable, silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. Additionally, previously disturbed soils would be classified as Type B, unless they have characteristics of the third type of soil, Type C.
- Type C soils include granular soils such as gravel, sand, and loamy sand. It also includes any soil that is submerged or soil from which water is freely seeping, and submerged rock that is not stable.

PROTECTIVE SYSTEMS

- Workers face the risk of serious injury or death if they enter an unprotected trench, and the walls collapse.
- There is no reliable warning when a trench fails. The walls can collapse suddenly, and workers will not have enough time to move out of the way.
- Unfortunately, a lack of protective systems is the leading cause of trench-related fatalities.
- OSHA requires that all excavations 5 feet deep or greater make use of one of the following protective system options: sloping, benching, shoring, or shielding.
- Sloping involves reducing the steepness of a trench face by cutting back the trench wall at an angle inclined away from the excavation. Proper sloping can minimize the risk of a trench collapse, and the angle of the slope depends on the stability of the soil.
- When sloping back a trench that consists of Type A soil, its walls must be sloped back on a ratio of ¾ to 1. For example, a trench that is 6 feet deep requires each wall be sloped back a distance of 4 ½ feet to prevent collapse.
- When sloping back a trench that consists of Type B soil, its walls must be sloped back on a ratio of 1 to 1. For example, a trench that is 6 feet deep requires each wall be sloped back a distance of 6 feet to prevent collapse.
- And, when sloping back a trench that consists of Type C soil, the least stable of all soil types, its walls must be sloped back on a ratio of 1 ½ to 1. For example, a trench that is 6 feet deep requires each wall be sloped back a distance of 9 feet to prevent collapse.
- Another method used to prevent cave-ins is benching. Benching occurs when the sides of a trench are shaped to form horizontal levels or “steps.” However, it’s important to note that benching is NOT allowed in Type C soil.
- Shoring is the practice of adding support to the side walls of an excavated trench in order to prevent soil movement, cave-in, or collapse. Shoring requires the installation of aluminum, hydraulic, or other types of physical support.
- Trench shielding, such as a trench box, does little to prevent a collapse or cave-in. Rather, its purpose is to protect the workers inside if a cave-in should occur.
- Workers should never enter a trench that does not have a protective system in place designed and installed by a competent person. The risk is just far too great.
- Also, be aware of potential hazards from undermining sidewalks and buildings. The competent person must take measures to control these hazards also.
- In some circumstances, when conditions in a trench or excavation become hazardous, survival may depend on how quickly workers can climb out.
- This is why OSHA requires that all trenches or excavations 4 feet or deeper have a safe means of entry and exit within 25 feet of workers at all times. Examples include ladders or ramps with a recommended slope of 20 degrees.

HAZARDS AROUND EXCAVATIONS

- Excavated material, or “spoils,” at your site are hazardous if they are set too close to the edge of a trench.
- As we mentioned earlier, one cubic yard of dirt weighs over 2,000 pounds. And when the spoil pile is placed on the edge of a trench, all that weight can easily cause the trench wall to collapse, or the spoil pile may shift and slide into the trench. This can be prevented by always placing spoil at least two feet from the edge of an excavation. If this is not possible, the spoil may need to be temporarily hauled to another location.
- All other equipment, materials, and vehicles must be kept a safe distance from the trench edge and secured in a manner that prevents them from rolling into the trench.
- Material rolling into a trench can easily cause an injury.
- Utilizing a retaining device such as a trench box that extends above the top of the trench can also help prevent equipment and spoils from falling into the excavation.

- Standing water and atmospheric hazards can also pose a risk to workers in trenches in excavation sites.
- The presence of water in an excavation is an indicator of increased danger. Water reduces the stability of the soil and greatly increase the soil's weight, both of which make a collapse or cave-in much more likely.
- Water also presents other hazards, such as electrocution or drowning.
- Typically, water is removed from excavations using pumps, and entry is prohibited until approved by the competent person.
- The employer should ensure that trenches and excavations are tested for hazardous atmospheres any time dangerous conditions are likely to occur.
- Examples of hazardous atmospheres include oxygen levels below 19.5%, the presence of toxic gases that are heavier than air, such as such as hydrogen sulfide, or the presence of carbon monoxide which can be generated by running equipment that is inside or near the excavation.
- Dangerous atmospheric conditions are more likely to exist in excavations of 4 feet or greater.
- When atmospheric testing indicates the existence of a hazard, forced air ventilation may be used to control the hazard. When this is not effective, appropriate respiratory protection may be required.
- Most construction workers and equipment operators are familiar with the hazards presented by overhead powerlines.
- It's important for excavation workers to understand that high voltage powerlines also exist underground, along with gas, water, sewer, and other underground utilities.
- Before any digging begins, it's critical that local utilities are contacted so any underground utilities may be located and marked.

STRUCK-BY HAZARDS

- Employers should also consider potential struck-by hazards associated with heavy equipment, falling loads, and public vehicular traffic in close proximity to the excavation operations.
- All excavation workers should wear a high-visibility vest or shirt and stay alert for moving equipment and vehicles at all times.
- Never stand directly behind equipment or in any location where the operator cannot see you.
- Do not approach or cross the path of heavy equipment without first making eye contact with the operator and receiving an indication that it is safe to do so.
- All non-essential personnel should stay well clear of any raised loads, and no person should ever place themselves directly under a raised load.

CONCLUSION

- Excavations and trench work pose a serious and sometimes fatal threat to employees. But with the proper safety precautions in place, you can dramatically reduce the risk of injuries and excavation incidents at your jobsite.
- You don't have to be an official competent person to recognize an unsafe trench or excavation. Take the information presented in this program and use it to remain safe, healthy and injury-free.

TRENCHING AND EXCAVATION SAFETY

ANSWERS TO THE REVIEW QUIZ

1. a
2. b
3. a
4. a
5. a
6. b
7. a

TRENCHING AND EXCAVATION SAFETY
REVIEW QUIZ

Name_____Date_____

The following questions are provided to determine how well you understand the information presented in this program.

1. On average, each cubic yard of dirt in a trench or excavation can weigh well over 2,000 pounds.

a. True
b. False

2. A competent person cannot perform a soil analysis.

a. True
b. False

3. Other than stable rock, there are three common types of soils that are categorized based on stability: Type A, Type B, and Type C.

a. True
b. False

4. OSHA requires that all excavations 5 feet deep or greater make use of one of the following protective system options: sloping, benching, shoring, or shielding.

a. True
b. False

5. OSHA requires that all trenches or excavations 4 feet or deeper have a safe means of entry and exit within 25 feet of workers at all times.

a. True
b. False

6. Standing water and atmospheric hazards do not pose a risk to workers in trenches in excavation sites.

a. True
b. False

7. All excavation workers should wear a high-visibility vest or shirt and stay alert for moving equipment and vehicles at all times.

a. True
b. False