MODULE 3—EXCAVATION AND TRENCHING

At the end of this module, you will be able to…

- Cite facts relating to excavation and trenching injuries.
- Define the important words that relate to excavation and trenching.
- Recognize and use the OSHA regulations that relate to excavation and trenching.
- Identify practices at your work that protect you from excavation and trenching injuries.
- Perform a worksite analysis to find hazards that could cause an excavation or trenching injury.
- Describe behaviors at your worksite that could cause an excavation or trenching injury.

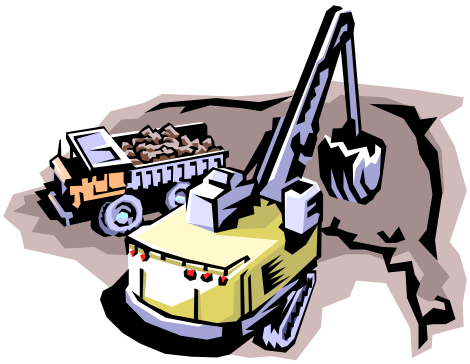
Activity: Can You Find The Excavation and Trenching Hazards?

Directions: Look at the photo below as well as the slide your facilitator shows you. Can you find the hazards that relate to excavation and trenching? Write them in the space below.

Photo courtesy of Construction Safety Council

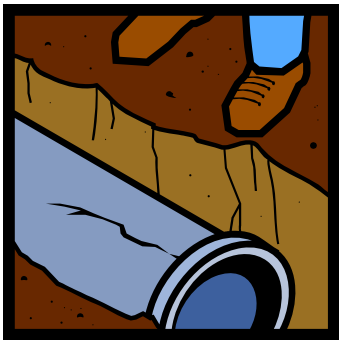
Facts about Excavation and Trenching

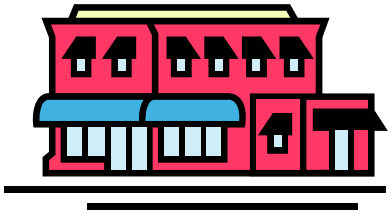
Did You Know?



- About 1,000 workers get hurt every year by excavation cave-ins.
- Of these, about 140 cause permanent disability, 75 cause death.
- The rate of deaths due to excavation is 112% higher than the rate for general construction.

- 38% of all excavation incidents are due to cave-ins.
- Trenches tend to collapse very quickly, leaving no time to react.





- 37% of all trenching incidents occur at depths of less than 5 feet.
- Small construction projects of under $50,000 cause most of the cave-in deaths.

Words You Need to Know

Here are some words we will use in this excavation and trenching module.

Excavation—A man-made cut, cavity or hole in the ground made by removing earth.

Trench—A narrow excavation (in relation to its length). In general, the depth is greater than the width. It is never more than 15 feet wide.

Spoils—The materials (dirt, earth) that are removed from an excavated area.

Cave-In—The loosening of soil or rock from the side of an excavation, and its sudden falling or sliding into the excavation. It's how workers often get trapped.

Confined Space—A space that has limited openings and poor ventilation. It may contain hazardous substances and is not intended for constant employee use. Some excavations and trenches are considered confined spaces.

Soil Sample—A section of soil that is analyzed to determine the type of protection system that needs to be built.

Protection Systems

The following are methods of protecting employees from cave-ins.

Benching System—This system protects employees by forming the sides of an excavation into a series of steps.

Sloping System—This system protects employees by inclining, or "sloping" the sides of the excavation away from the excavation.

Shoring System—This is a structure that supports the sides of an excavation. It can be metal hydraulic, mechanical or timber.

Shield System—This is a structure used at excavations. It is designed to withstand the forces of a cave-in and protect the employees inside. A shield can be permanent or portable, like a trench box.

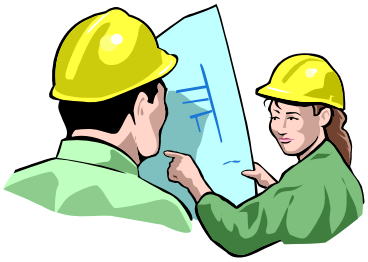
Note: For your use at excavations, Page 19 of your Pocket Reference Guide contains a chart that shows the various soil classifications.

The Competent Person for Excavation and Trenching

Before we look at the OSHA requirements, let's talk about the competent person for excavation and trenching.

What is a competent person?

Who is the competent person at your construction site?



Note: A complete description of the qualifications and duties of a competent person for excavation and trenching can be found on Page 20 of your Pocket Reference Guide.

OSHA and Excavation

OSHA has many standards that relate to excavation and trenching. Some are in OSHA 29 CFR 1910, General Industry Standards. Others are in OSHA 29 CFR 1926, Construction Standards. To read more about any of these regulations, see the OSHA website at www.osha.gov. You can access the OSHA website using the hyperlink on your Tools and Resources CD-ROM.

OSHA 29 CFR 1910.146

Confined Spaces

This standard describes how to protect employees working in confined spaces.

OSHA 29 CFR 1926, Subpart D

This subpart addresses environmental controls in construction.

1926.55	Describes how to protect employees from gases, vapors, fumes, dusts and mists
1926.57	Addresses ventilation requirements

OSHA 29 CFR 1926, Subpart E

This subpart addresses personal protective and life saving equipment.

1926.104	Addresses the use of safety belts, lifelines and lanyards
1926.106(a)	Addresses the requirements for keeping employees safe around water

OSHA 29 CFR 1926, Subpart P

This subpart addresses employee safety at excavations.

1926.651(c)(1)(i)	Describes the requirements for excavation entry and exit
1926.651(h)(1)	Describes the requirements for working in water
1926.651(j)(2)	Describes how to protect employees from the spoils of an excavation
1926.651(k)	Describes the requirements for inspections
1926.651(k)(2)	States that employees must be removed from hazardous situations
1926.652	Describes the requirements for protective systems
Appendix A	Describes how to evaluate soil conditions
Appendix F	Describes how to select the appropriate protective systems

Activity: OSHA Quiz

Directions: Test how well you know the OSHA regulations. Following are five statements. Decide whether each statement is true or false, then check the appropriate box. Use the extra space to take notes during the quiz discussion.

	TRUE	FALSE	
1.	❒	❒	Because trenches are outdoors, it is <u>not</u> necessary to be concerned about hazardous air. The outdoor air will neutralize any bad air in the trench.
2.	❒	❒	If you are working in a trench where there are only a few inches of water, you are permitted to work in the trench.
3.	❒	❒	If an excavation needs a ramp for entering and exiting, anyone on the construction crew can be assigned to find a ramp and put it in place.
4.	❒	❒	When a construction crew digs for an excavation, it is okay to pile the dirt that is dug up (the spoils) right at the edge of the excavation.
5.	❒	❒	A competent person has the authority to evacuate an excavation site if that person believes the site is exposing employees to unsafe conditions such as a possible cave-in or hazardous air.

Activity: Best Practices and Injury Prevention Strategies

Directions: Identify some of the best safety practices that you use on the job in each of the following areas.

Spoil Placement—Describe the safety practices you use at excavations relating to spoil placement.

General Work Practices—Describe your best general work practices relating to excavations.

Checklist for the Worksite Analysis—Excavation and Trenching

Every day, when you begin work at your excavation site, you should check for hazards that could cause an injury. Following is a list you can use when you do this check.

ITEM	OK?	CORRECTIVE ACTIONS
Spoil Placement		
• Are spoils at least 2 feet back from the excavation?	_____	_____
• If spoils are not 2 feet back, do you use retaining devices, such as a trench box, to protect the excavation site.	_____	_____
• Are the spoils placed so that rainwater and other run-off move away from the excavation?	_____	_____
• If spoils can't be placed safely at the excavation site, are they hauled to another location?	_____	_____
Protection Systems		
• Has a competent person selected the site's protection system?	_____	_____
• Has a competent person overseen the installation of the protection system?	_____	_____
• Is the protection system accurate for the soil type?	_____	_____
• Is the protection system inspected every day by the competent person?	_____	_____

Checklist for the Worksite Analysis—Excavation and Trenching

ITEM	OK?	CORRECTIVE ACTIONS
Safe Entry and Exit		
• Do you have a safe way to enter and exit if the excavation is 4 or more feet deep?	_____	_____
• Is access within 25 lateral feet of workers?	_____	_____
• Are access ramps designed by a competent person?	_____	_____
• Do ramps have a non-slip surface?	_____	_____
• Can you walk upright on an earthen ramp?	_____	_____
• Are ladders secured?	_____	_____
• Do ladders extend at least 36 inches above the landing?	_____	_____
• Do you avoid using metal ladders if electricity is present at the site?	_____	_____
Vehicle Safety		
• Do you wear a warning vest marked with or made of reflectorized or high visibility materials?	_____	_____
• Is there a trained flag person who designates traffic at the excavation site?	_____	_____
• Are you trained to use hand or mechanical signals as a way to communicate?	_____	_____
• Is the excavation site fenced and barricaded at night?	_____	_____
• Does mobile equipment have a warning system?	_____	_____

Checklist for the Worksite Analysis—Excavation and Trenching

ITEM	OK?	CORRECTIVE ACTIONS
Surface Crossing		
• If there is a vehicle crossing, is it designed and installed under the supervision of a registered professional engineer?	_____	_____
• Do walkways have a minimum clear width of 20 inches?	_____	_____
• Are walkways fitted with hand rails?	_____	_____
• Do walkways extend a minimum of 24 inches past the surface edge of the trench?	_____	_____
Water Management		
• If there is water, does the site have special support or shield systems approved by a registered professional engineer?	_____	_____
• Does the site have water removal equipment, such as pumps, used and monitored by a competent person?	_____	_____
• Are surface waters diverted from the excavation?	_____	_____
• Do you use a safety harness or a lifeline?	_____	_____
• Are employees required to leave the site during rainstorms?	_____	_____
• Is the site carefully inspected by a competent person after each rain and before employees are permitted to re-enter?	_____	_____

Checklist for the Worksite Analysis—Excavation and Trenching

ITEM	OK?	CORRECTIVE ACTIONS
Hazardous Atmosphere		
• Is the atmosphere tested for possible oxygen deficiency or build-up?	_____	_____
• Is the oxygen content maintained at between 19.5% and 21%?	_____	_____
• Is ventilation provided to prevent flammable gas build-up to 20% of lower explosive limit of the gas?	_____	_____
• Is emergency response equipment readily available?	_____	_____
Inspections		
• Is your excavation site inspected by a competent person?	_____	_____
• Is the site inspected daily and before the start of each shift?	_____	_____
• Is site inspected after rainstorms?	_____	_____
• Is the site inspected after other events that could increase hazards such as snowstorms, windstorms, thaws or earthquakes?	_____	_____
• Is the site inspected when fissures, cracks, sloughing, undercutting, water seepage or bulging at the bottom occur?	_____	_____
• Is the site inspected when there is a change in the size, location or placement of the spoil pile?	_____	_____
• Is the site inspected when there is indication of change or movement in adjacent structures?	_____	_____
• Are site inspections documented?	_____	_____

Checklist for the Worksite Analysis—Excavation and Trenching

ITEM	OK?	CORRECTIVE ACTIONS
General Safety Practices		
• Do you wear a hard hat at all times?	_____	_____
• Do you avoid working or walking under a suspended load?	_____	_____
• Do you avoid working on faces of sloped or benched excavations above other employees?	_____	_____

OSHA Resources for this checklist are:

- 29 CFR 1910.146
- 29 CFR 1926 Subpart D
- 29 CFR 1926 Subpart E
- 29 CFR 1926 Subpart P

Note: To help you perform a worksite analysis when you are working at a job site, this checklist is reprinted on Pages 21-25 of your Pocket Reference Guide.

Activity: Can You Find The Excavation and Trenching Hazards?

Directions: Look at the slides your facilitator shows you. Can you find the hazards that relate to excavation and trenching? Write them in the space below.

Case #1

Case #2

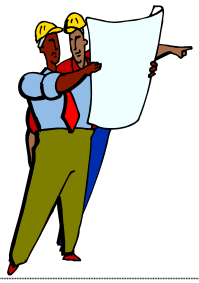
Case #3

Case #4

Activity: Concerns at Your Worksite

Directions: Think about the sites where you usually work. Now answer the following questions as they relate to working safely at an excavation or trenching site.

1. Describe some areas where it is tempting to take shortcuts or cut corners when you are working at an excavation site. How does this create hazards?



2. Describe behavior that you have seen that you think could cause an excavation or trench injury.