Excavation Safety – Trenching & Shoring

Maryland Center for Environmental Training
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Excavation Safety - Trenching & Shoring

OSH 8830

7 Contact hours

9 CC10 hours

OSHA states excavation and trenching are among the most hazardous construction operations. They define an excavation as any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal. Participants will be introduced to the requirements of the OSHA Excavation Standard, 29 CFR 1926 (Subpart P). Subjects covered will be the causes of trench failure, soil classification, trench protection systems, hazardous atmospheres and conditions, inspection techniques, and competent person responsibilities. This course will provide the basic training requirements for "competent persons." Additional instruction will be given on: tests used to classify soil types in the field; the different methods of cave-in protection; selecting proper shoring methods using the provided OSHA tables; and the methodology used to minimize these and other hazards.

1. Identify excavation hazards at a construction site;

2. Identify those regulations pertinent to excavation sites;

3. Classify four different types of soil and discuss how each is handled on a trenching site; and

4. Explain the role and authorities of the competent person.

8:00 AM to 8:30 AM	Introduction
8:30 AM to 9:30 AM	Why safe trenching?
9:30 AM to 11:00 AM	Safety Regulations; Excavation Standards and the Role of the Competent Person
11:00 AM to 12:00 PM	Soils Classification and the Anatomy of a Cave-in
12:00 PM to 1:00 PM	LUNCH
1:00 PM to 1:45 PM	Cave-in Protection Systems
1:45 PM to 3:00 PM	Job Site Hazard Identification
3:00 PM to 3:30 PM	Break out Activity
3:30 PM to 4:00 PM	Final Exam

MCET
environmental, health, and safety training

Maryland Center for Environmental Training
at the
COLLEGE of SOUTHERN MARYLAND

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Trenching & Shoring Safety
29CFR 1926.650

"Staying Alive in the Trench"

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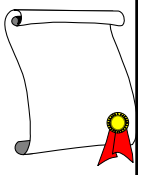
OBJECTIVES

At the conclusion of this session, you should be able to:

- List the trenching hazards.
- Explain the role of the competent person.
- Discuss the requirements of the OSHA regulations.
- Be familiar with dangers on the jobsite.



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FACT:

- Each Year in the U.S. Cave-ins:
  - Kill 100 workers.
  - Seriously injure 5000 workers.

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FACT:

- Cave-ins can happen without warni
- All of the fatalities and injuries could have been prevented.

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The Top Five Trenching Hazards

- Cave-ins
- Overhead Electric Line Contact
- Falls into Excavations
- Equipment Falling into Excavations
- Explosion / Fire / Electrocution

But the most dangerous hazard is:

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UNSAFE ATTITUDES

- "I Know what I'm doing."
- "It can't happen to me."
- "I've been doing it that way for years."
- "I'd sleep in that hole!"
- "Don't worry, we'll watch the walls and tell you if you need to get out."

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How to Die With Your Boots On:

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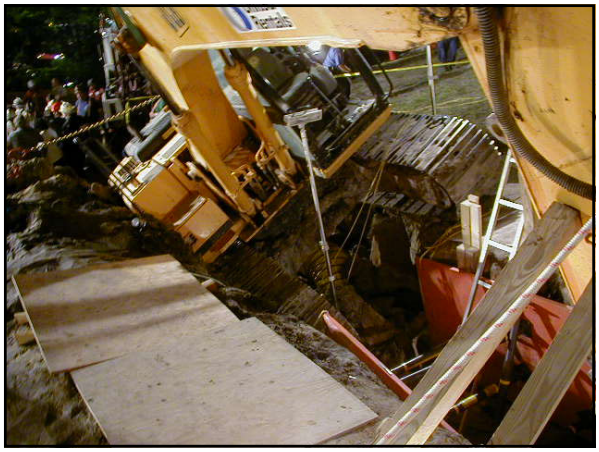

SAFETY VIDEO

"Don't Dig Your Own Grave"

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HOW CAN I PROTECT TRENCH WORKERS?

- Use adequate pre-job planning.
- Prepare for anything on the jobsite.
- Follow OSHA Standard

29 CFR 1926
Subpart P: Excavations

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What's In the Standard?

- Excavation scope, application and definitions
- Job Site Hazard Listing
- Requirements for Protective Systems
- Appendixes that detail:
  - Soil Classification
  - Sloping and Benching
  - Timber and Aluminum Hydraulic Shoring
  - Protective System Selection Decision Tree

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Who's Legally Responsible for Safety?

The general duties of employers as stated in Maryland law 5-104, requires employers to provide a safe and healthful place of employment free from recognized hazards.

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Who's Really Responsible for Safety?

- ***Everyone*** on the site - individually and collectively.
- On-site ***Safety Manager***
- The ***Competent Person***

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The Competent Person Must:

- Be trained in ***soil analysis*** and protective systems.
- Know the ***safety requirements***
- Be able to ***identify*** safety and health hazards.
- Have knowledge of ***corrective actions.***
- Have the ***authority*** to make corrections

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THE DUTIES INCLUDE:

- ***Knowing*** the work environment.
- ***Inspecting daily,*** prior to work and throughout the day.
- Inspecting after each ***hazard increasing occurrence***:
- ***Integrating*** activity into the site safety and health program.

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TRENCH BASICS

- **What is it?**
  - **A narrow excavation**
  - **The depth is generally greater than the width.**
  - **The width is not greater than 15 feet at the bottom.**

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Protection Required...

- Employees must be protected from cave-in *in all excavations* except:
  - Stable rock or equivalent, or
  - Less than 5 feet, ***AND***
  - Examined by the competent person, who determines there is no potential for cave-in

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The Ladder Rule

- A Ladder must….
  - Be installed at 4' in depth, or less if determined by the Competent person.
  - Be within 25 feet of trench workers.
  - Extend 3 feet above the top of the trench.

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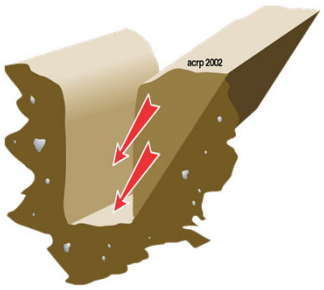
What Causes Cave-ins ?



A Cave-in Occurs Anytime the Strength of the Soil Is Overcome by the Weight of the Soil.

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Most Common Causes of Cave-ins:

- Poor Planning
- Misjudgment of soil type.
- Inadequate, or incorrect installation of protective devices.
- Defective protective devices.
- Failure to adjust for changing conditions

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Soil Strength is Dependent Upon:

- Type of Soil.
- Amount of Moisture in the Soil.
- Whether the Soil Has Been Previously Disturbed.

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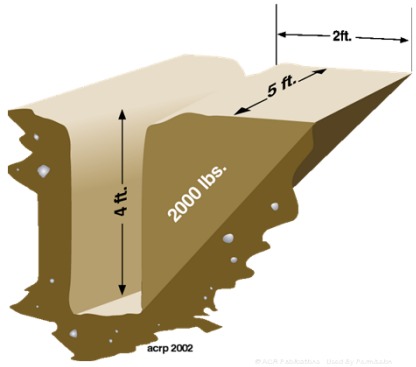
Soil Weight Example



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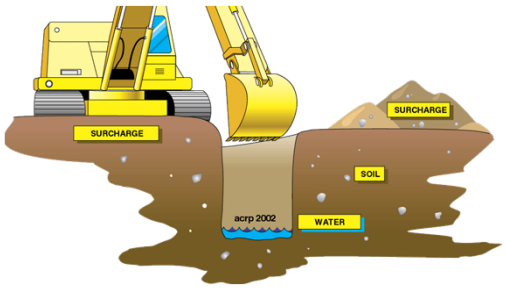
Forces Acting on a Trench



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ADD TO THE MIX...

- **Fissures** - *existing cracks formed along definite planes in soil structure*
- **Layer Slides** - *natural shifting along different soil layers*

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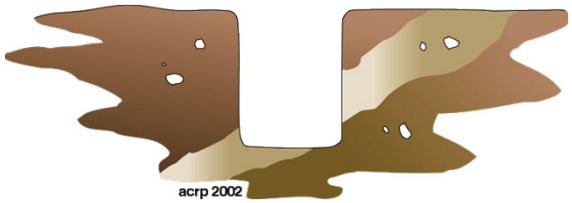
SOIL LAYERING



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If Water is Added

- **It Brings Additional Weight**
  - *Hydrostatic Pressure*
- **It Erodes the Trench Wall**
  - *Water movement typically moves soil*
- **It Can Freeze and Thaw**
  - *Resulting in cracks & false cohesion*

REMOVAL OF GROUND WATER IS CRITICAL

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Other Factors Influencing Cave-Ins

- **Nearby Trenches**
- **Previously Disturbed**
- **Vibration**
- **Surcharged Load**
- **Drying / Saturation**

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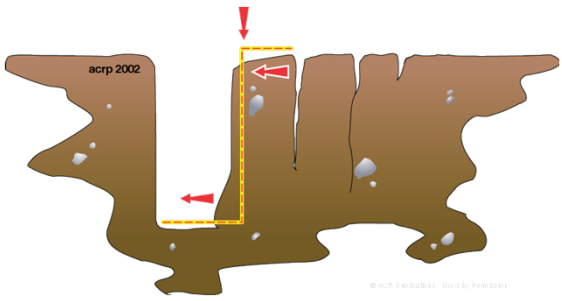
EFFECTS OF UNSUPPORTED SOIL



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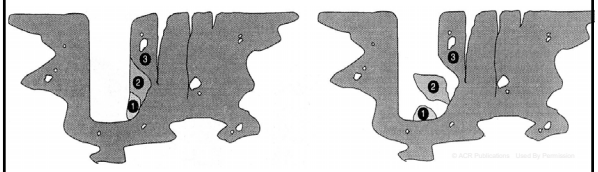
THE TYPICAL CAVE-IN



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SOIL STRENGTH MEASURE
Unconfined Compressive Strength (UCS)

- The amount of pressure in tons per square foot (tsf) required to cause the soil to fail.
- OSHA Soil Classification is based on the UCS of the soil.

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OSHA Soil Categories:

- Stable Rock
- Type A Soil (UCS >= 1.5 tsf.)
- Type B Soil (UCS > .5 and < 1.5 tsf.)
- Type C Soil (UCS < .5 tsf)

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METHODS TO PROTECT WORKERS FROM CAVE-INS

- **SLOPING**
- **SHIELDING**
- **SHORING**

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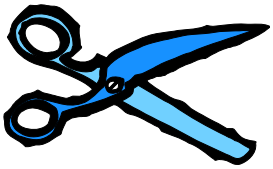
SLOPING

The cutting back of the sides of the excavation to protect the employees from cave-ins.



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Sloping Options

- Allowable configuration - 34 degrees
- Soil Analysis and Max Slope (Appendix A & B)
- Other Tabulated Data
- Professional Engineer

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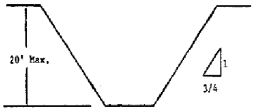
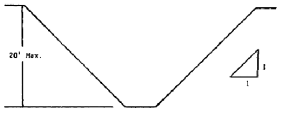
Examples of Sloping for Different Soils

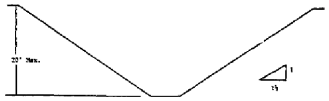
Type A



Type B



Type C



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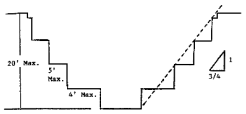
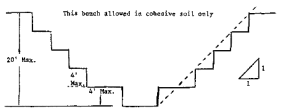
BENCHING

Only to be used on soil types A and B

Type A



Type B



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SHIELDING

The process where structures are used that are capable of withstanding the forces of cave-ins and protect the personnel within the structure.

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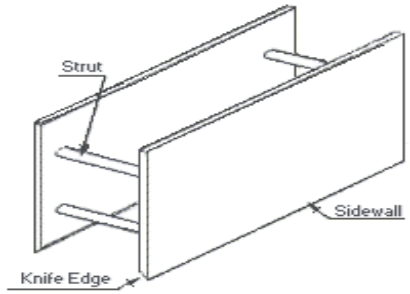
SHIELDS

Also known as trench boxes, mules, drag boxes



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SHIELD USAGE AND SAFETY

Shields are used to protect workers from cave-ins, not to provide support for the trench.

- Manufacturer's Data must be present at work site.
- Top of the shield must extend to the top of the trench.
- If used with sloping, top of shield must extend 18 inches above vertical trench walls.
- Shields may be stacked, provided the bottom one is rated for the total depth of the trench.
- The trench may be dug 2 feet lower than the shield bottom, but the shield must be rated for that depth.
- Backfill around the box to prevent lateral movement.

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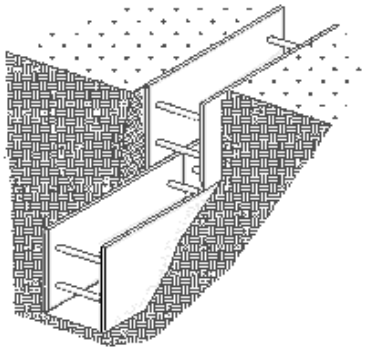
STACKING SHIELDS



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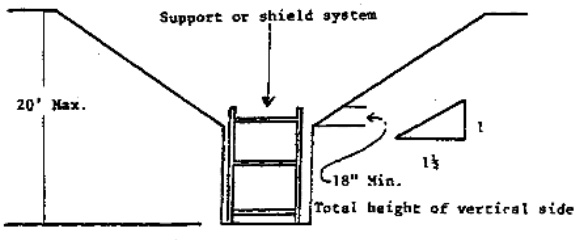
SHIELD WITH SLOPING



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Shield Used with Sloping

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SHORING

A cave-in protection system that consists of a structure that supports the sides of an excavation. It can made of metal or timber with hydraulic or mechanical supports.

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Shoring Options

- Use the tables provided by OSHA
- Use the manufacturer's data provided with the system.
- Use tables provided by a professional engineer.
- Use the shoring system designed by a professional engineer.

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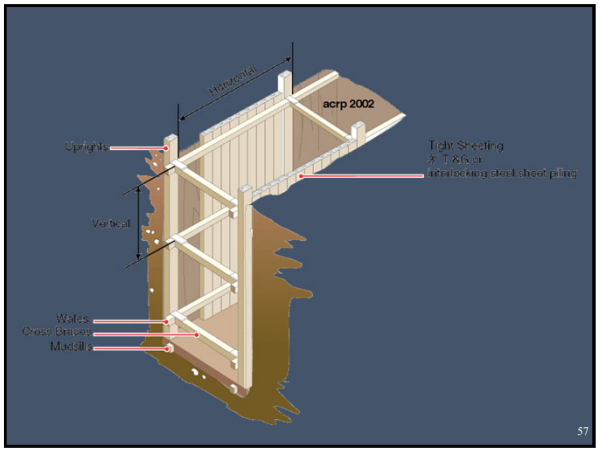

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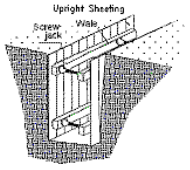
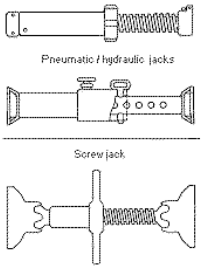
Mechanical Shoring

If used, manufacturer's data must be available on the job site





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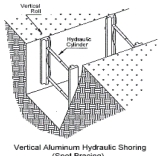
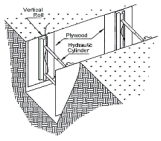
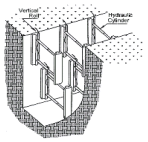
Hydraulic Shoring



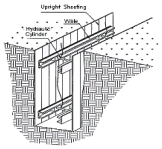
Vertical Aluminum Hydraulic Shoring (Spot Bracing)



Vertical Aluminum Hydraulic Shoring (With Plywood)



Vertical Aluminum Hydraulic Shoring (Stacked)



Aluminum Hydraulic Shoring Waler System (Typical)

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RULES FOR INSTALLATION AND REMOVAL OF SHORING

- Keep vertical members tight against wall
- Install from top down; Remove from bottom up
- Never go into the trench to install the shoring.
- Coordinate backfill of trench with shoring removal.

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Timber Shoring Usage

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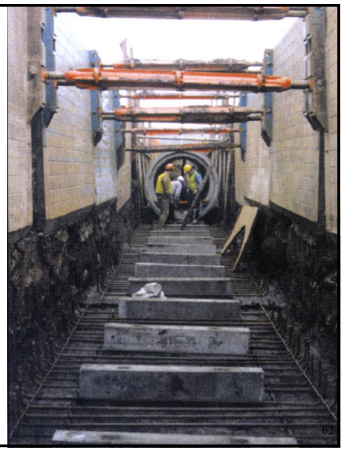
Hydraulic Shores In Use



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Hydraulic Shoring Usage

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Trenching Job Hazards

- Surface Encumbrances
- Underground Installations
- Access and Egress
- Vehicular Traffic
- Falling Loads

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Trenching Job Hazards

- Equipment Movement
- Hazardous atmospheres
- Water accumulation
- Stability of adjacent structures
- Loose soil protection
- Fall protection

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REMEMBER, TRENCH SAFETY IS EVERYONE'S RESPONSIBILITY

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KEEP THE JOB SAFE

SO YOU CAN GO HOME SAFE!

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