

Trenching

29 CFR 1926 Subpart P
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What will we talk about today?

- Hazards of trenches and excavations
- Safety rules for trenches and excavations.

What's the difference between a trench and an excavation?



An excavation is

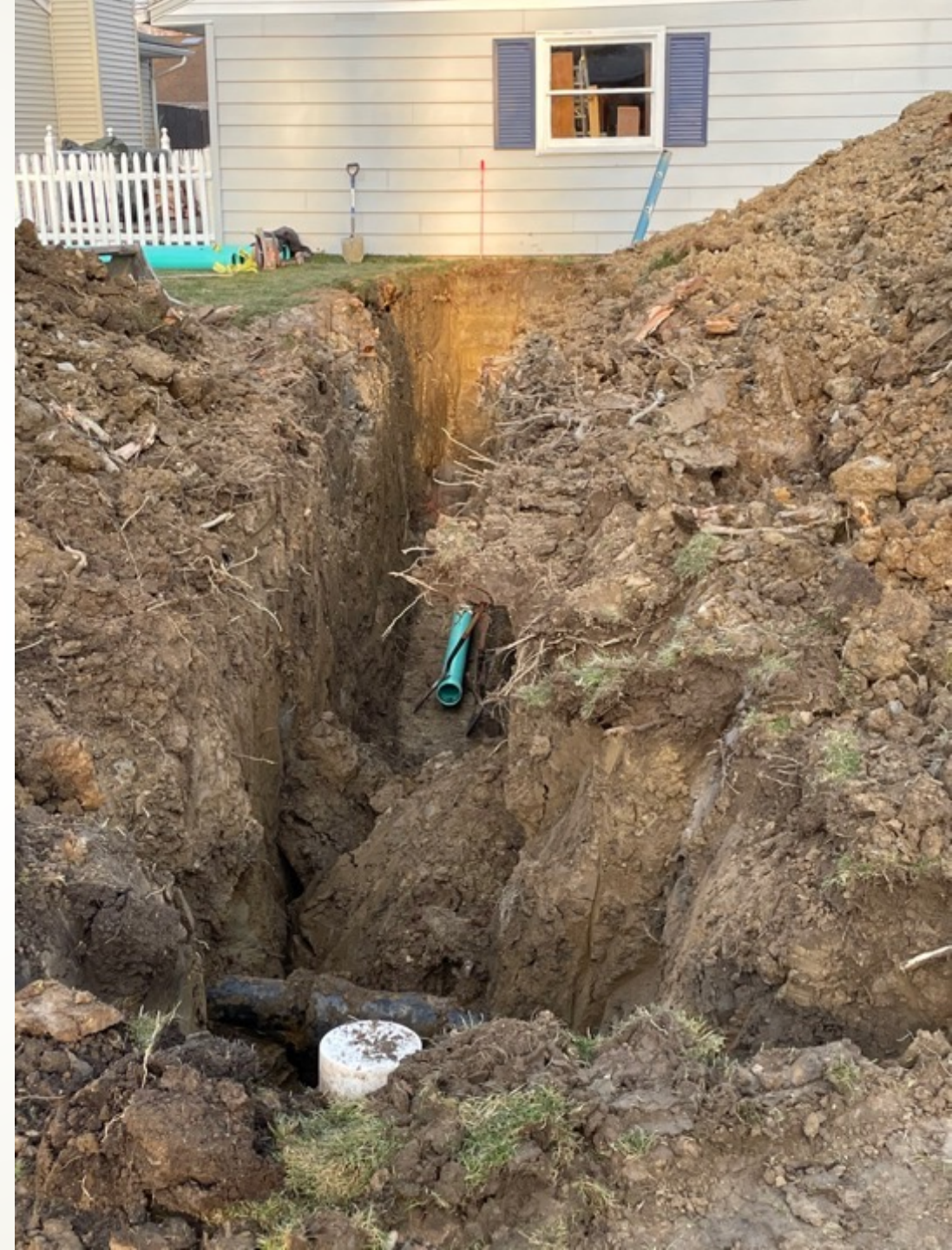


- Any man-made cut or depression
- In the earth surface
- Made by earth removal



A trench is

- An excavation
- Deeper than wide
- Less than 15ft wide at base





What do we know about the risks of trenches and excavations?

- Excavating is one of the most hazardous construction operations.
- One cubic yard of soil weighs as much as a car.
- Two workers are killed each month in trench collapses.



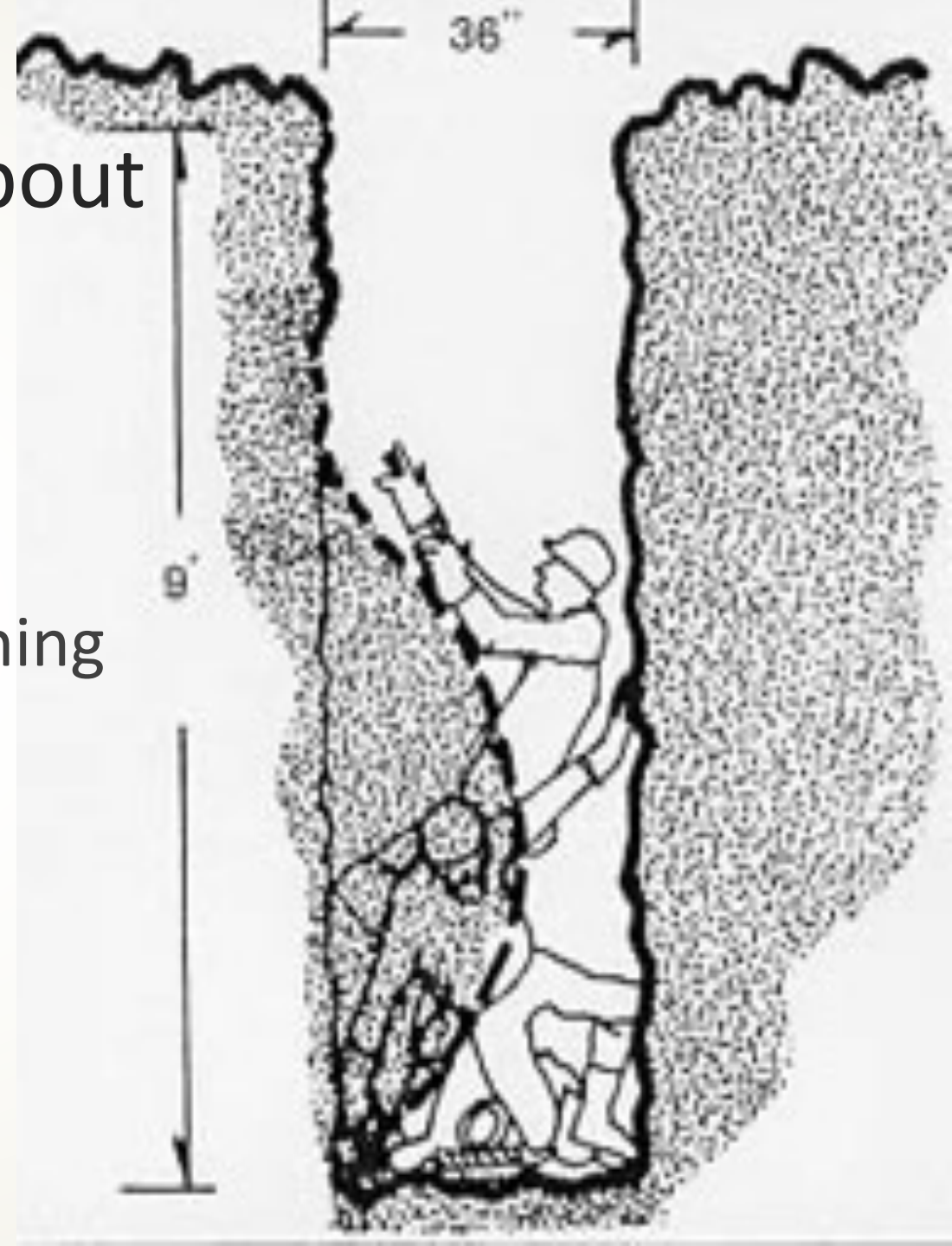


The No. 1 hazard is Cave-in



What do we know about trench collapses?

- Most accidents occur in trenches 5-15 feet deep
- There is usually no warning before a cave-in





What causes Cave-ins?



Water causes Cave-ins.

- Weakens sides
- Adds weight to walls
- Fills trench
- Undermines



Equipment causes Cave-ins.

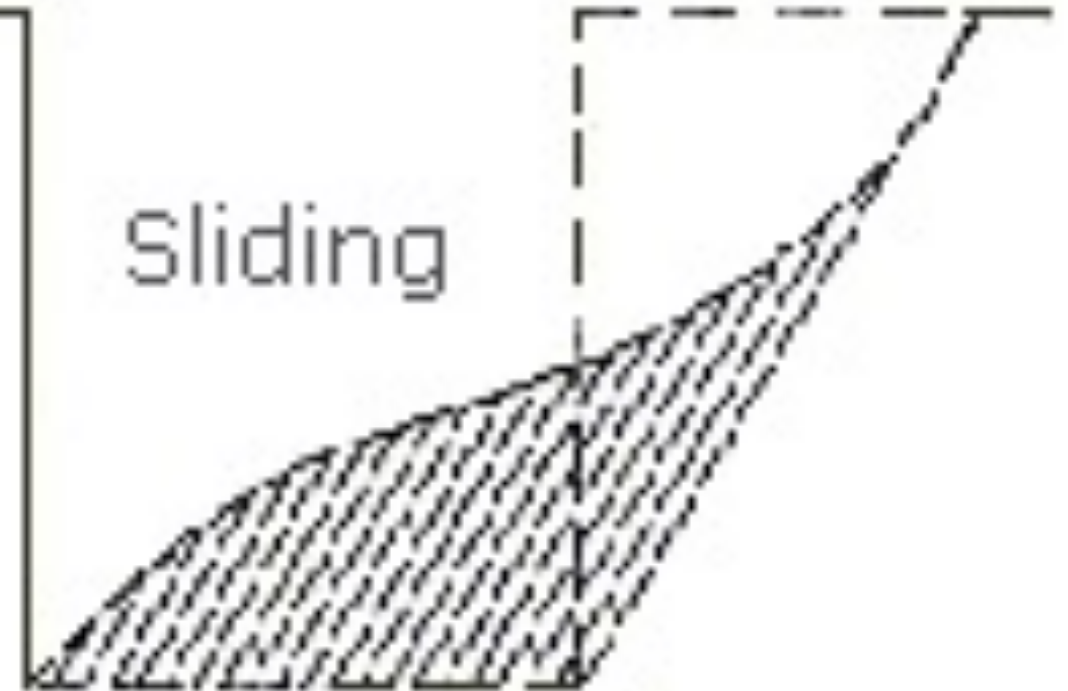
- Vibration
- Weight





Loose soil causes Cave-ins.

- Dry Sandy Soils
 - Not cohesive
 - Slide back into trench
- Clays are better





Previously disturbed soil is more likely to Cave in.

- Unstable
- Especially utility work



Trenching to access a sewer line is through previously disturbed soil.



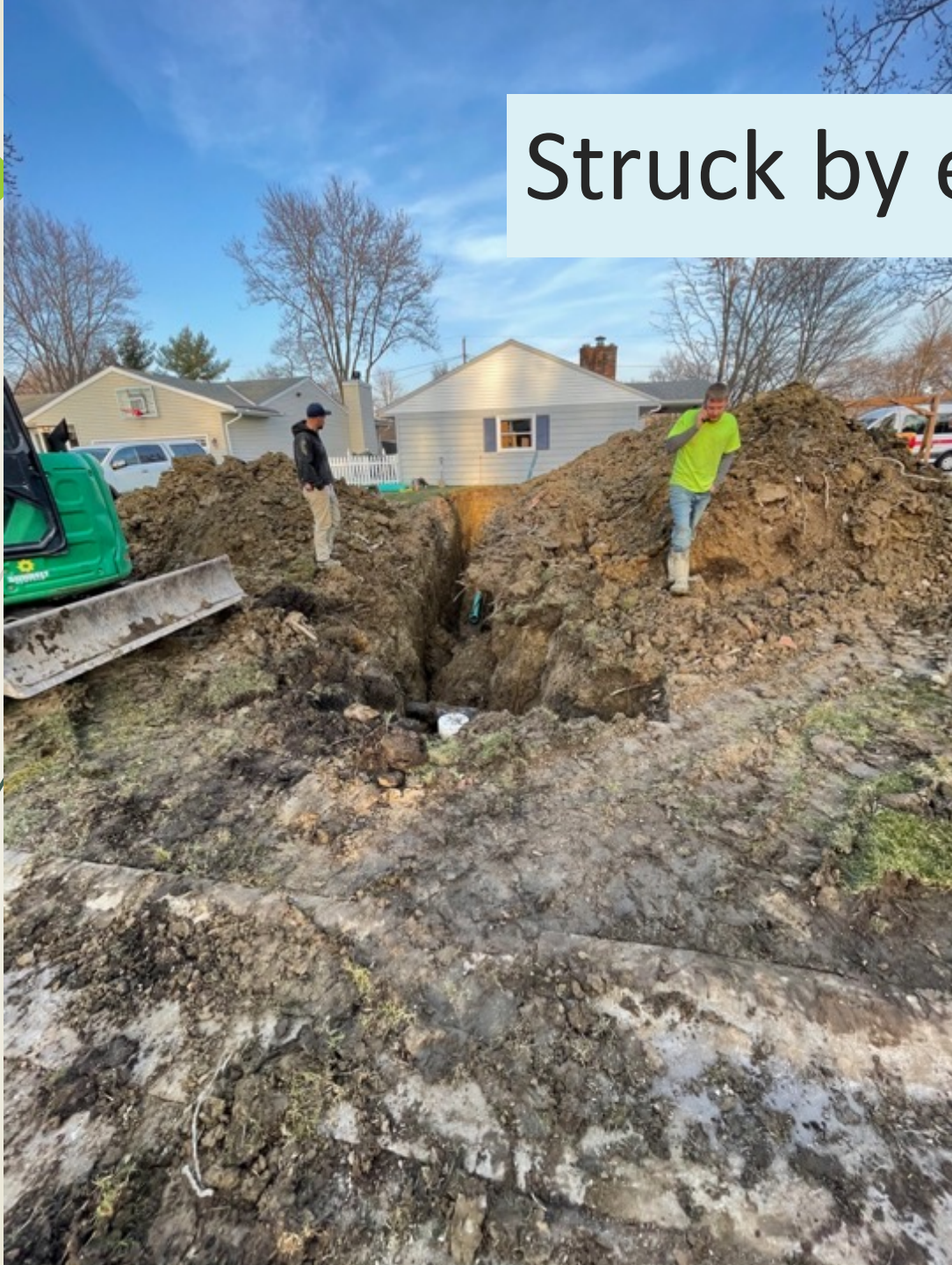
A spoil bank can cause Cave-in.

But there are other hazards...





Struck by equipment.





Hit by vehicle.



Objects falling from above.





Hazardous atmospheres



How can I minimize problems with trenches and excavations?



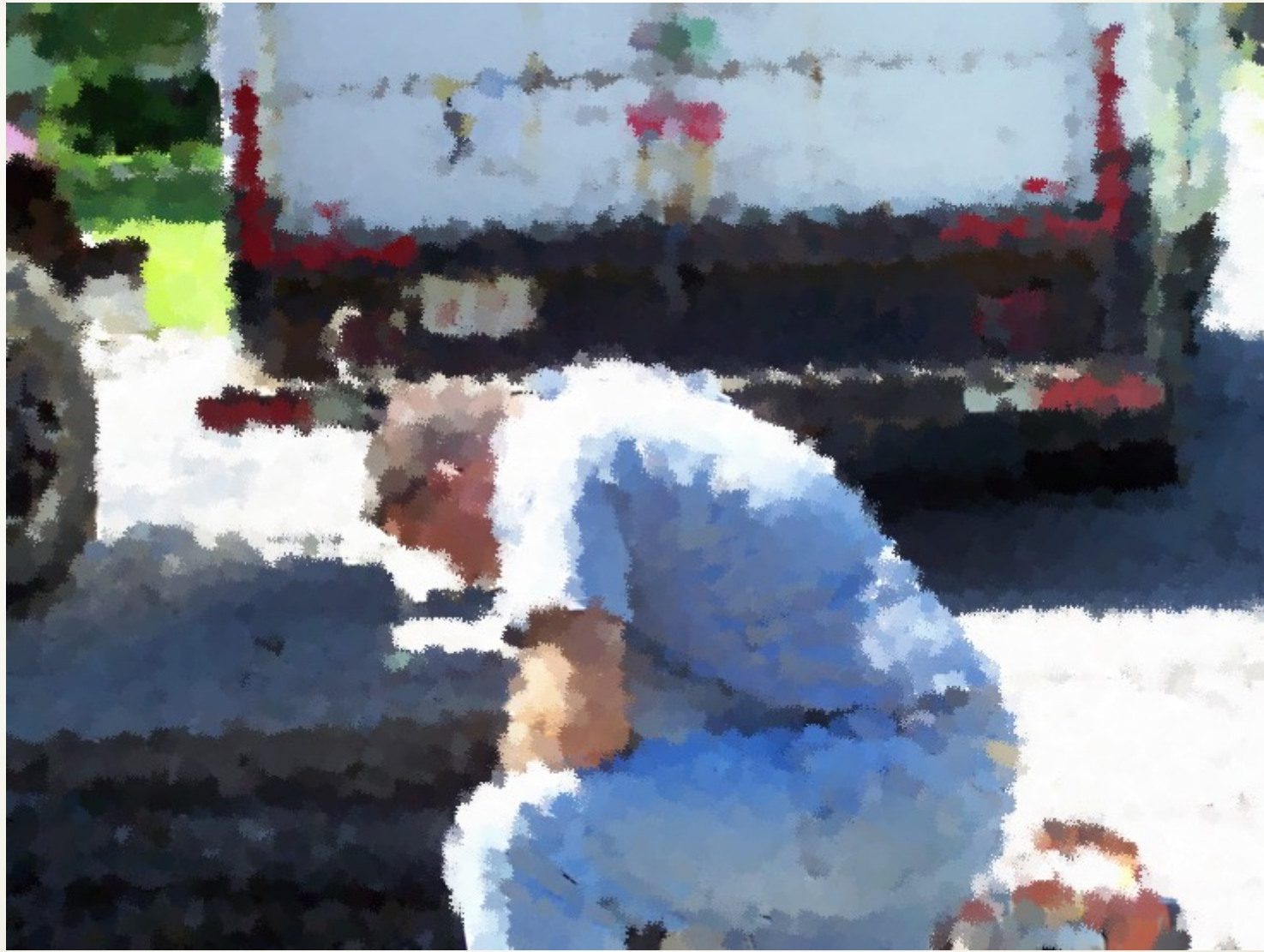


Assign a Competent Person to the job.





What does the Competent Person do?





The Competent Person identifies hazards.



The Competent Person analyzes soil types.

Penetrometer



The Competent Person takes corrective measures.



The Competent Person selects protective systems.





The Competent Person will not allow you to enter a trench $> 20\text{ft}$ deep unless it's been designed by a Professional Engineer.



The Competent Person knows when and how to check for atmospheric hazards.



What are typical tasks done by the Competent Person?



Competent person inspects daily before entry.



Should be onsite
when workers are in
trench.



Competent person inspects after rain or water seepage.



Competent person assures safe entry and exit.

➤ Ladder within 25ft at depth of 4ft



Competent Person makes sure a ladder is within 25 ft for excavations > 4 ft





Competent person assures trenches
> 5ft depth are protected.






Competent person finds underground utilities before digging.





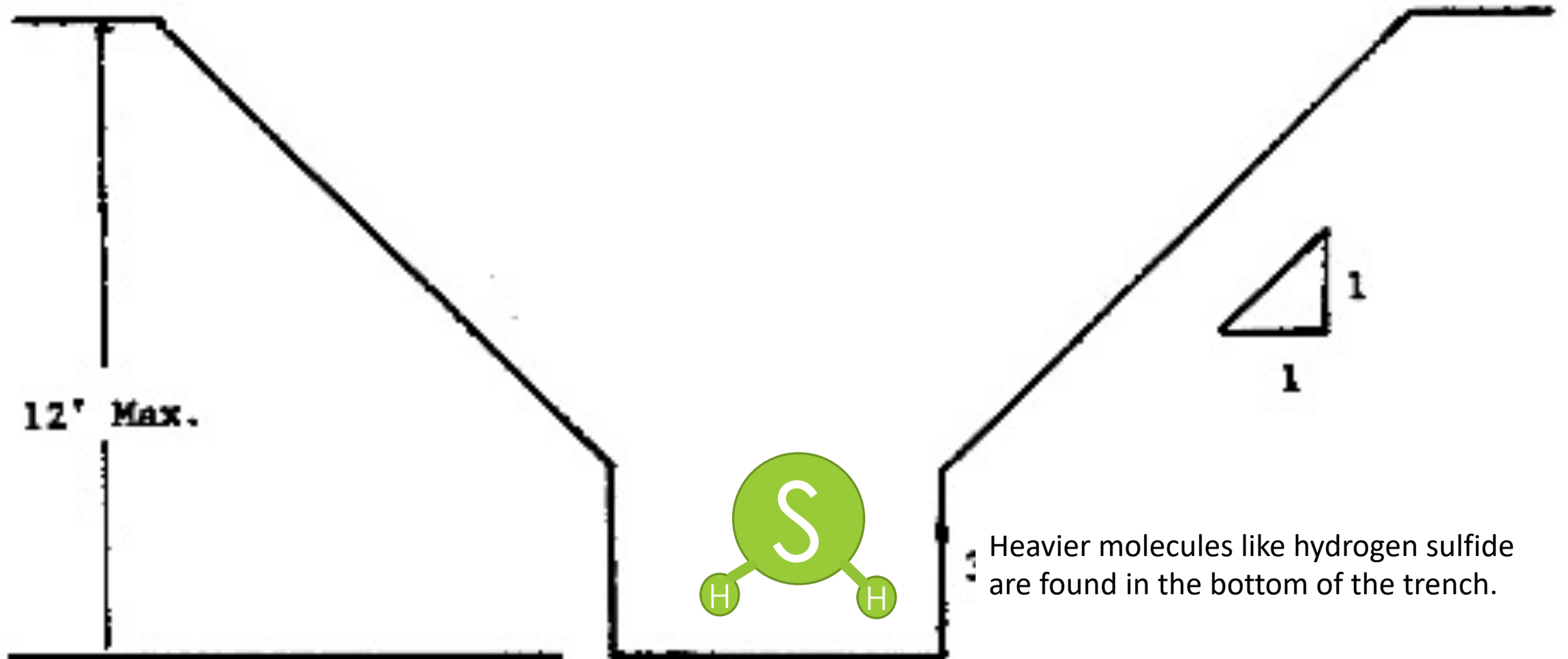
Competent person tests for O₂, explosive and poisonous gases at depths > 4ft.



What does the Competent Person need to know to do gas testing correctly?



Competent Person must know what gases are likely to be in the excavation and where they might be.





Select the right meter to check for those gases.

If I'm looking for H₂S, I'll need a meter that can detect it.



Correctly operate the meter.

- Choose the attachments.
- Calibrate the meter.
- Bump check the meter.
- Position the meter.
- And, ultimately, find the gases.



Competent Person

- Understands OSHA trenching regulations
- Can recognize trench hazards
- Is authorized to correct the hazards
- Does soil testing
- Selects protective systems





What can I do to make sure the excavation is done safely?



Inspect the trench before you enter.





Make sure you have a ladder within 25 ft.



For excavations > 4ft, a means of egress must be within 25 ft

Keep the trench dry.



Inspect trench after a rain.



Don't enter an excavation to install the shoring.



Stay out of excavations > 5ft that don't have a protective system.





Stay out of excavations > 20 ft deep unless protective system is designed by a PE.

Know location of utilities before you start.

- OGPUPS (Ohio Oil & Gas Producers Underground Protection Service)
- OUPS (Ohio Utilities Protection Service)



Wear high visibility clothing.





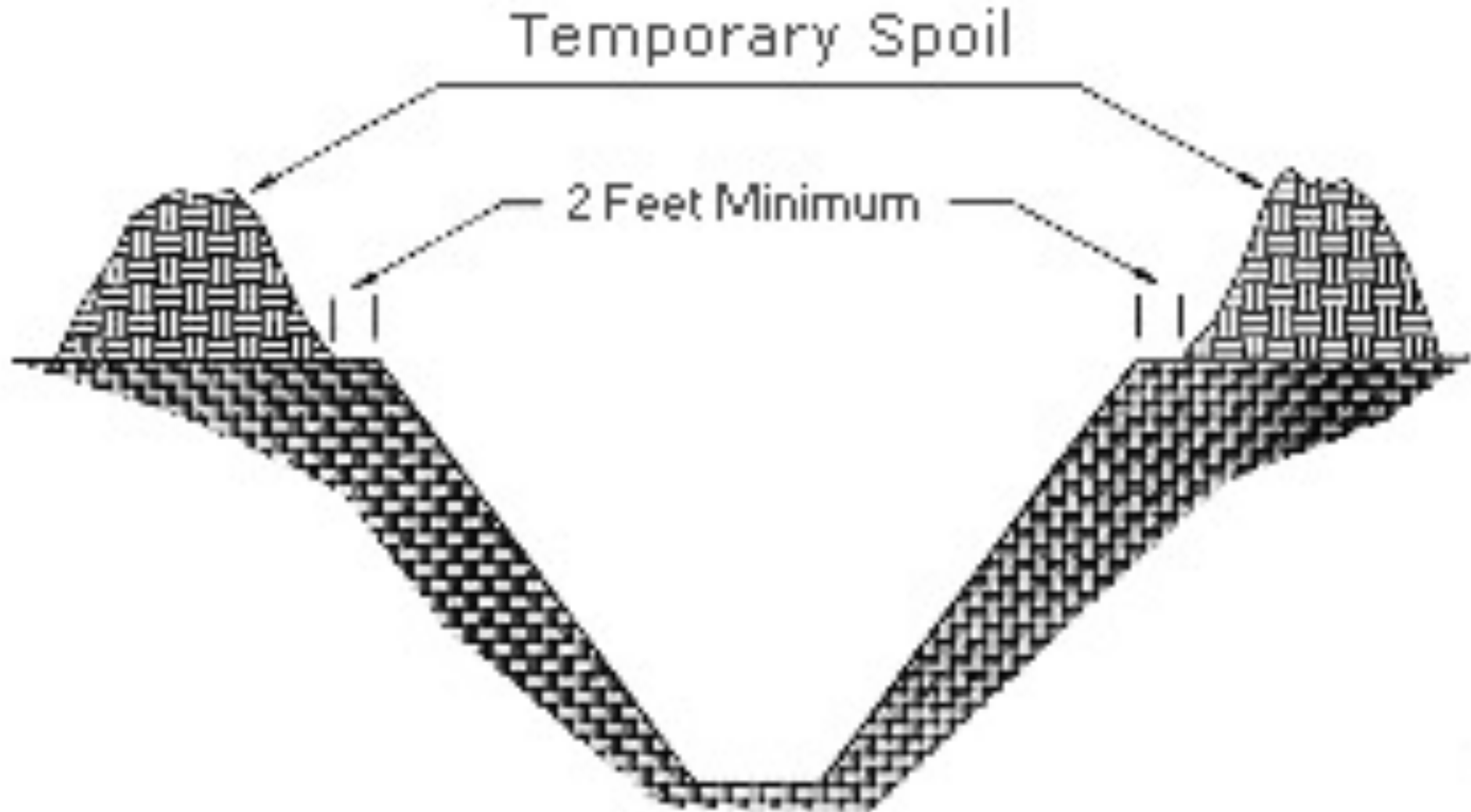
Don't work under raised loads.



Photo courtesy of OSHA.
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.



Keep soil, spoils, equipment at least 2ft from edge.





Keep heavy equipment away from edges.

➤ What is wrong here?

The spoils pile is at the edge of the trench.

There is no ladder for safe exit.

There is no cave-in protection.





Is there evidence that workers have entered this unprotected trench?



Yes

What kind of protective systems are available?





When are protective systems used?

- > 5 feet deep.
- Note: Competent Person may require protective system for excavations < 5 ft, if there may be a cave-in.



Sloping

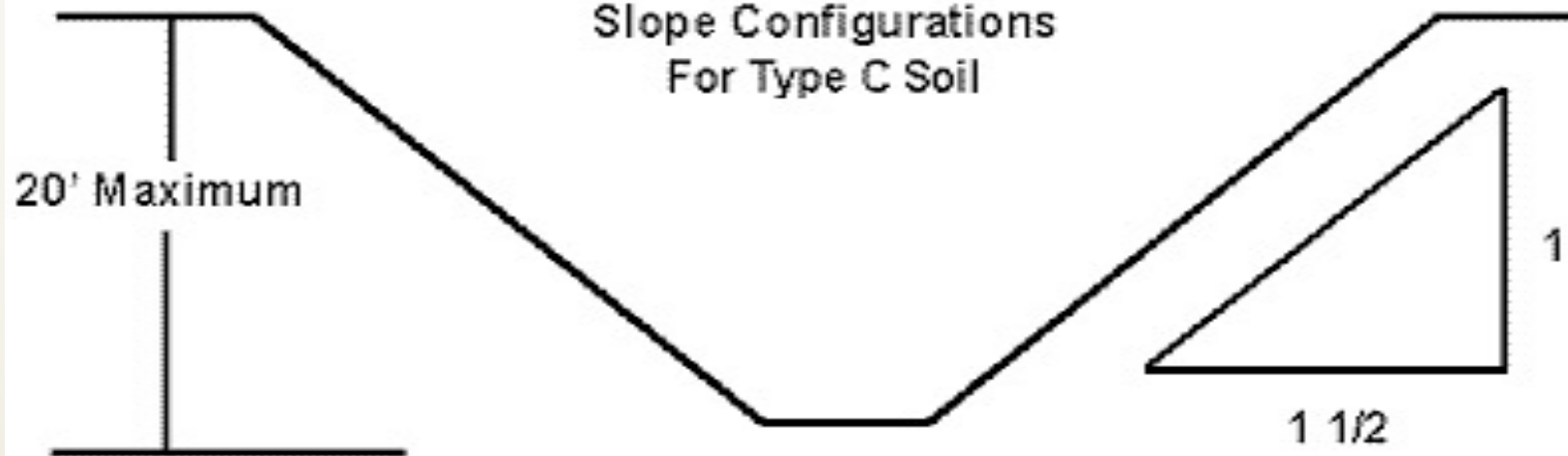
- The sides of the hole open out from the excavation.
- Soil type determines the required angle.
- Sloping is less practical for deeper digs.

Slope for Type C for the most conservative protection

Figure N-11

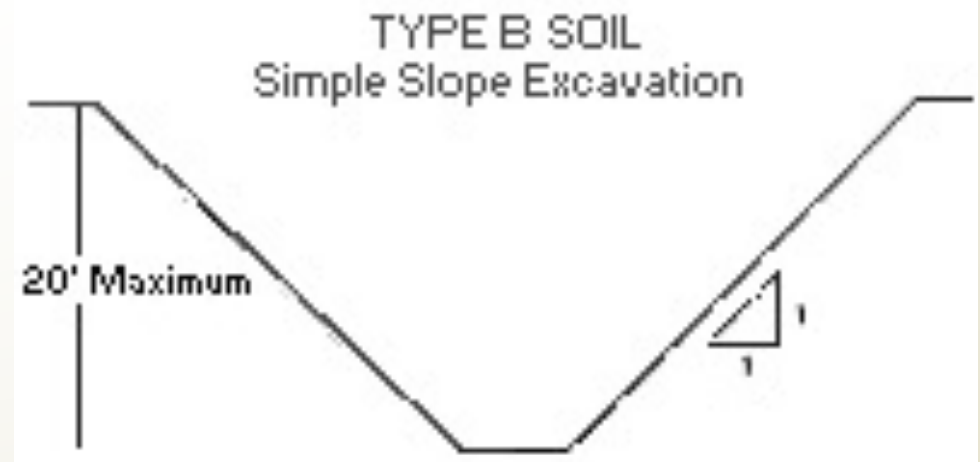
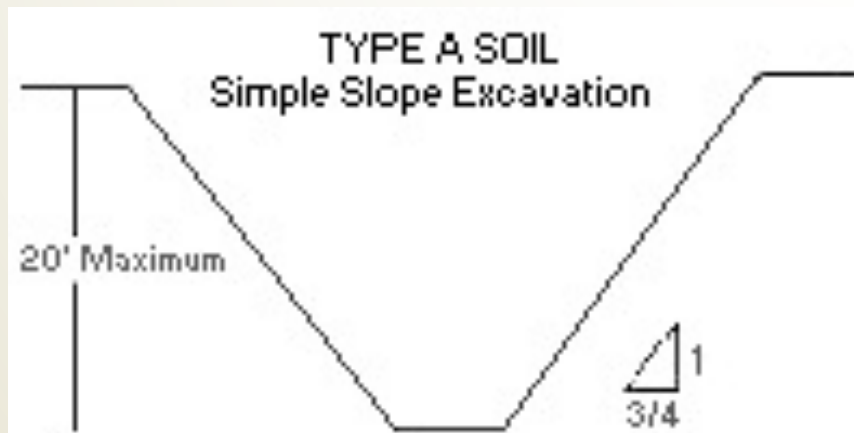
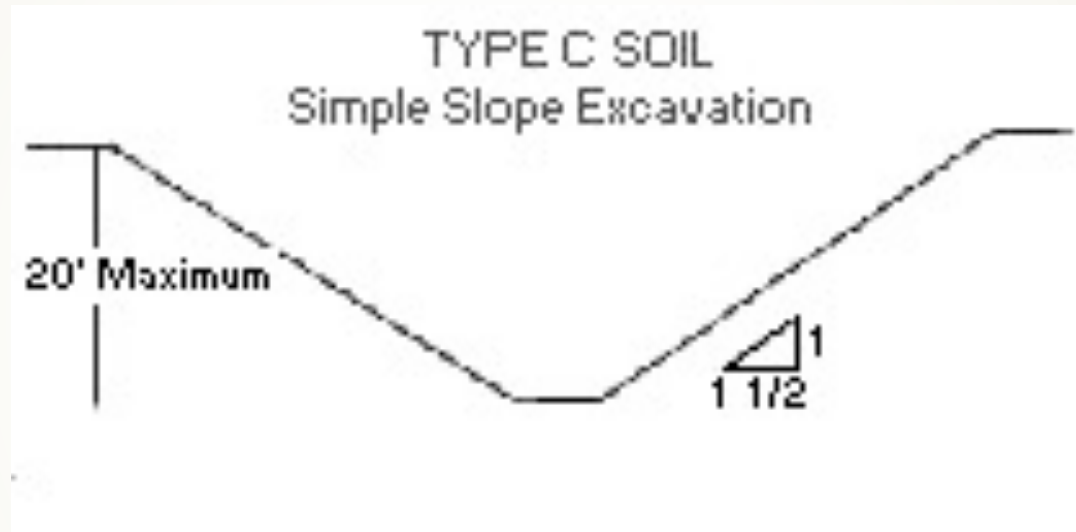
Type C Soil

The most unstable soil type





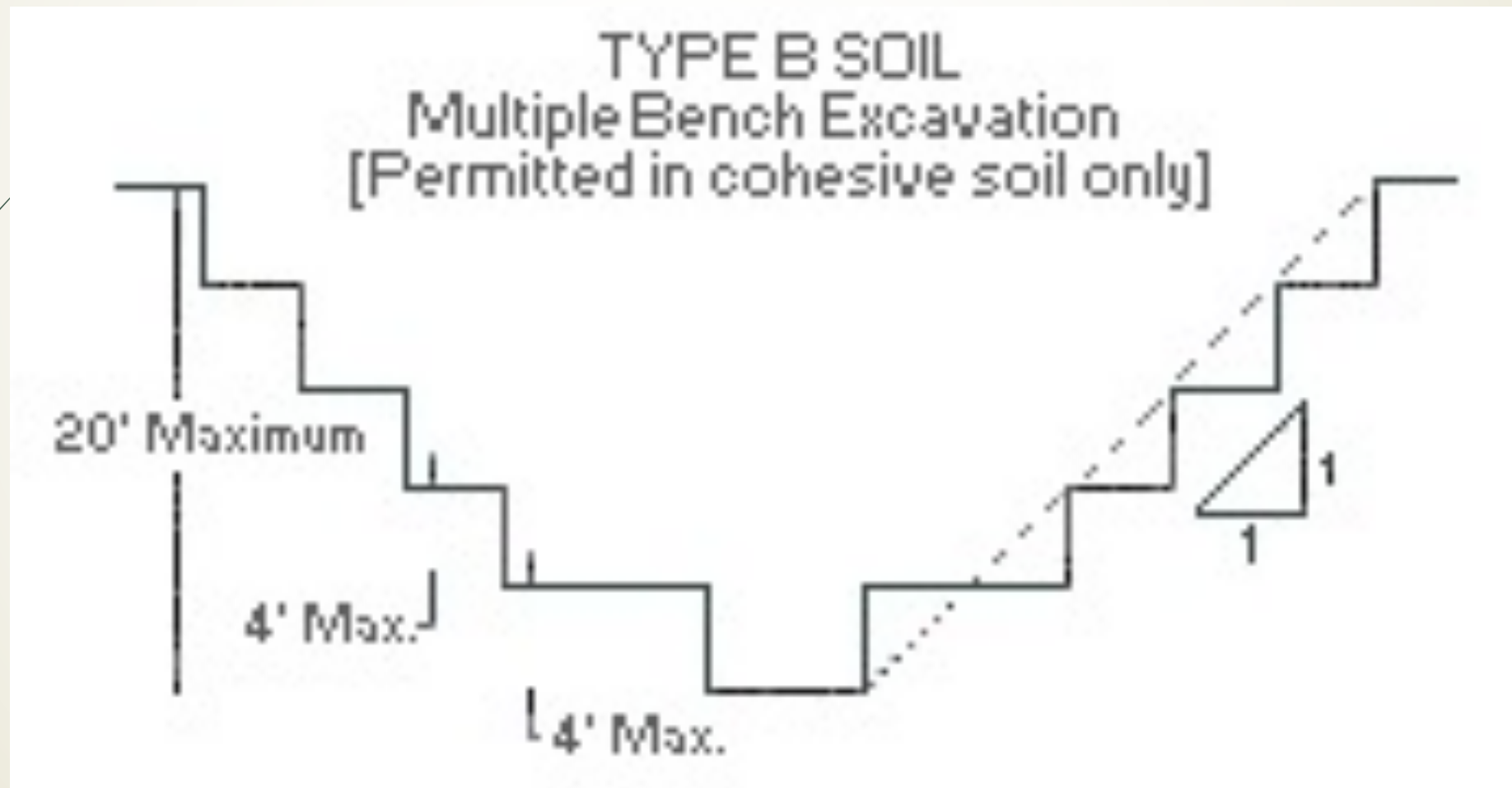
What are other soil types and what is their sloping?





Benching

- Sloping with steps cut into sides of the trench.



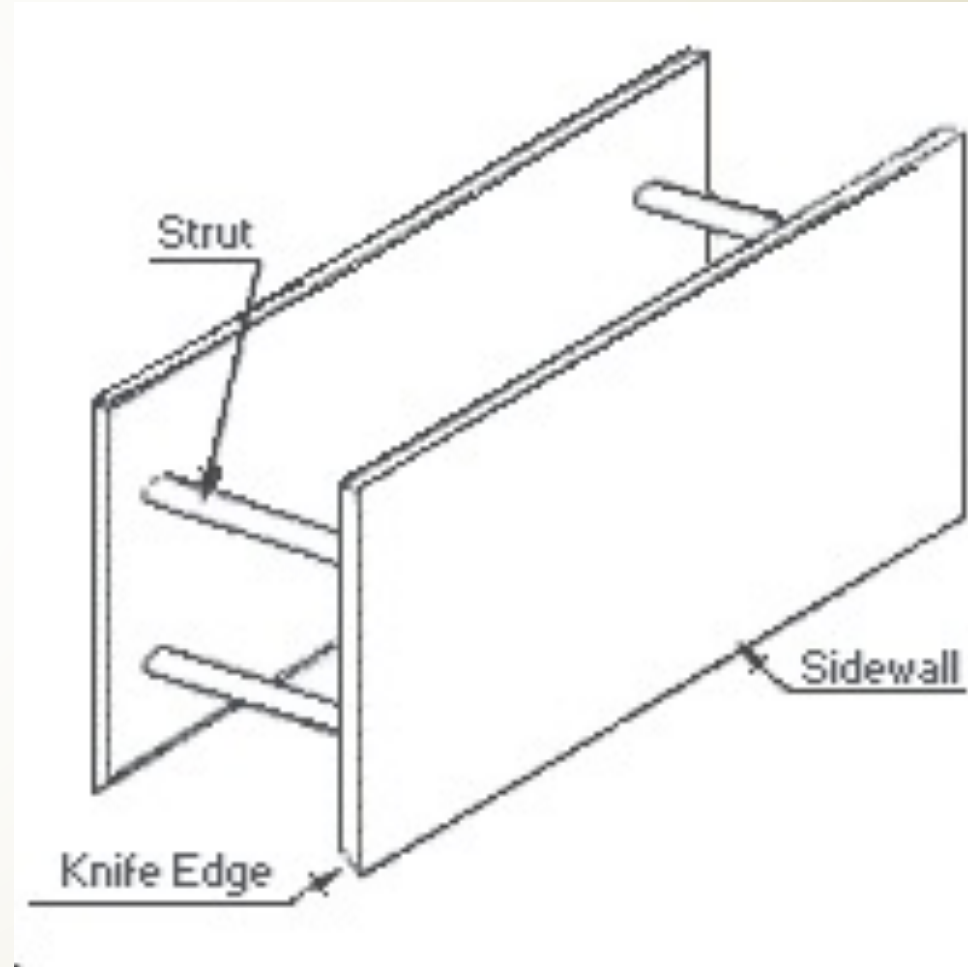
Shoring

- Supports the walls of the excavation.
- Made of wales, crossbraces, and uprights.
- Can be hydraulic or pneumatic.
- Must be installed from the top down and removed from the bottom up.
- Can be metal or wood
- Plywood and 2'x4's are not adequate shoring materials.



Shielding (trench boxes)

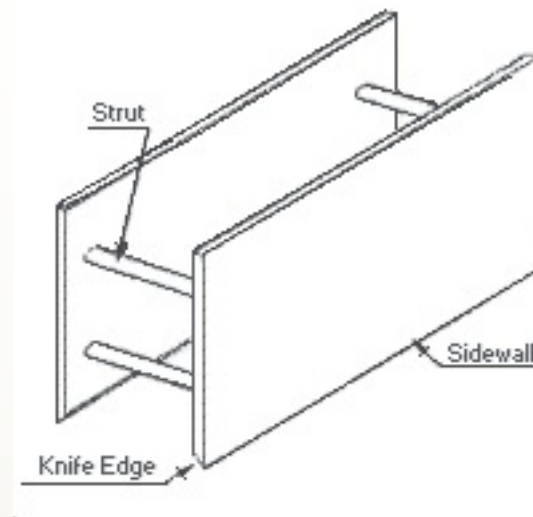
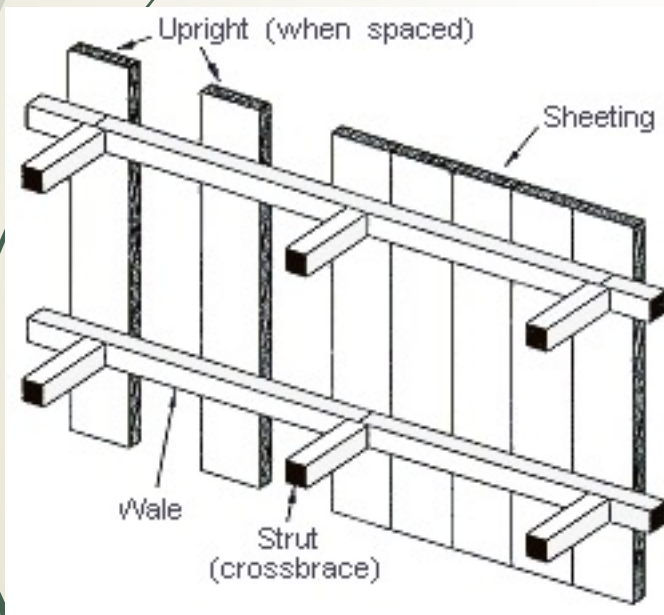
- ▶ Prevents the sides of a trench from caving-in.
- ▶ Worker is only protected while in the "box."
- ▶ Heavy equipment is used to place the box.
- ▶ Get out of the box and stand above ground when being moved.





Remember

- *A registered professional engineer MUST approve sloping and benching systems or any other excavation or trench that is greater than 20 feet in depth!*





➤ Is everything OK with this excavation?

✓ There is a ladder within 25 ft

✗ Ladder isn't 3 ft above road surface

✗ No protective system





Never Enter a Trench unless...

- Competent person has inspected it.
- Cave-in protection is in place.
- There is a safe way to enter and exit.
- Equipment and materials are away from edge.
- It is free of water and atmospheric hazards.



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