



*Pennsylvania PUC
Seminar*

*Shoring Could
Save A Life!*

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Trenching and Excavations

- Cave ins are not accidents
- Cave ins are PREDICTABLE
- CAVE INS ARE
PREVENTABLE





Construction Accidents

- 14 times more people are **KILLED** in **CAVE-INS** than any other accident.
 - An average of two people per week
 - **Why?**
 - **50% No Shoring**
 - **40% Improper Shoring**
 - **10% Spoil to close to edge**
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Who are Killed or Injured

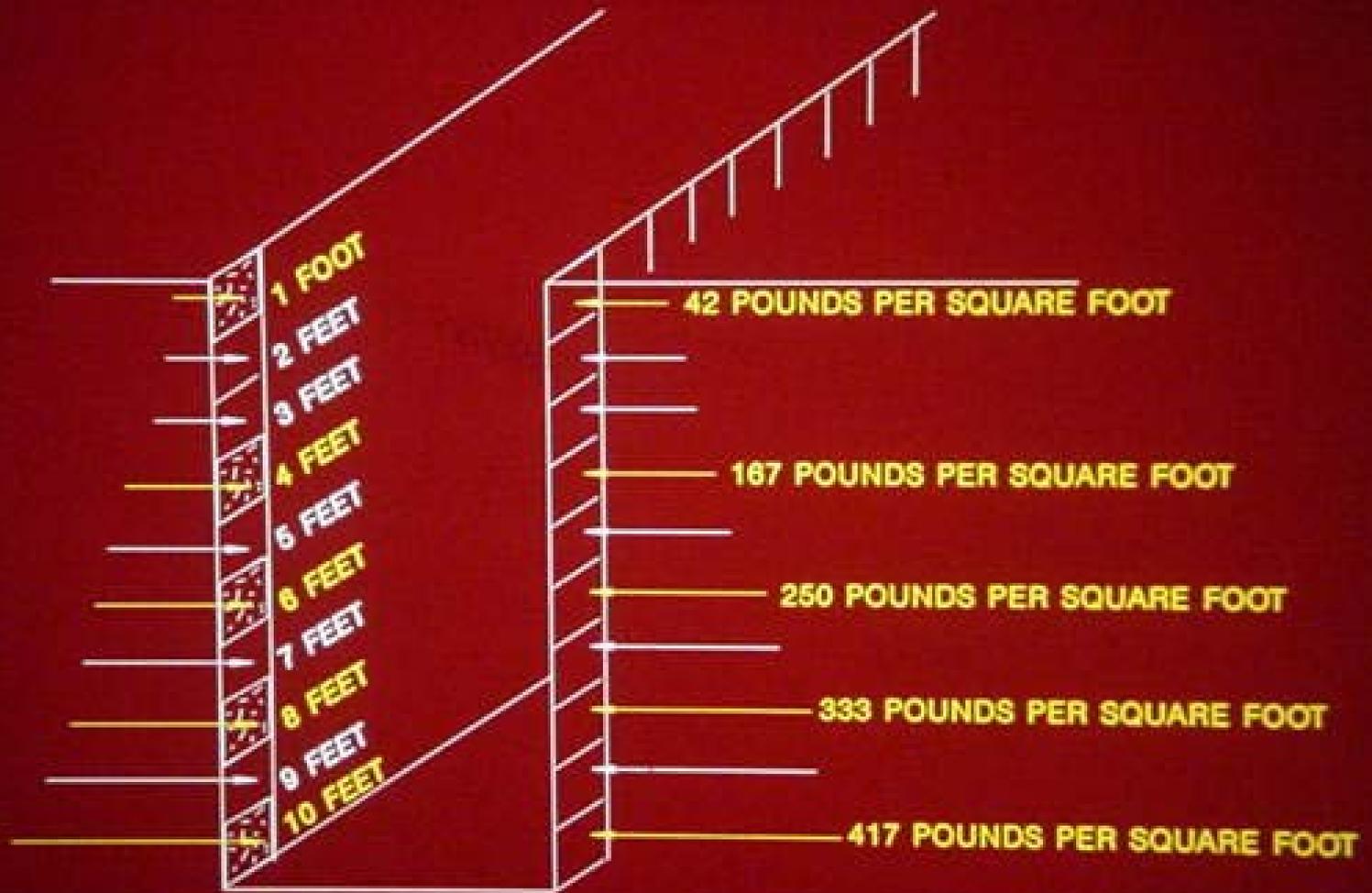
- Young or inexperienced often die!!
 - Exception is you are only “injured”
- 



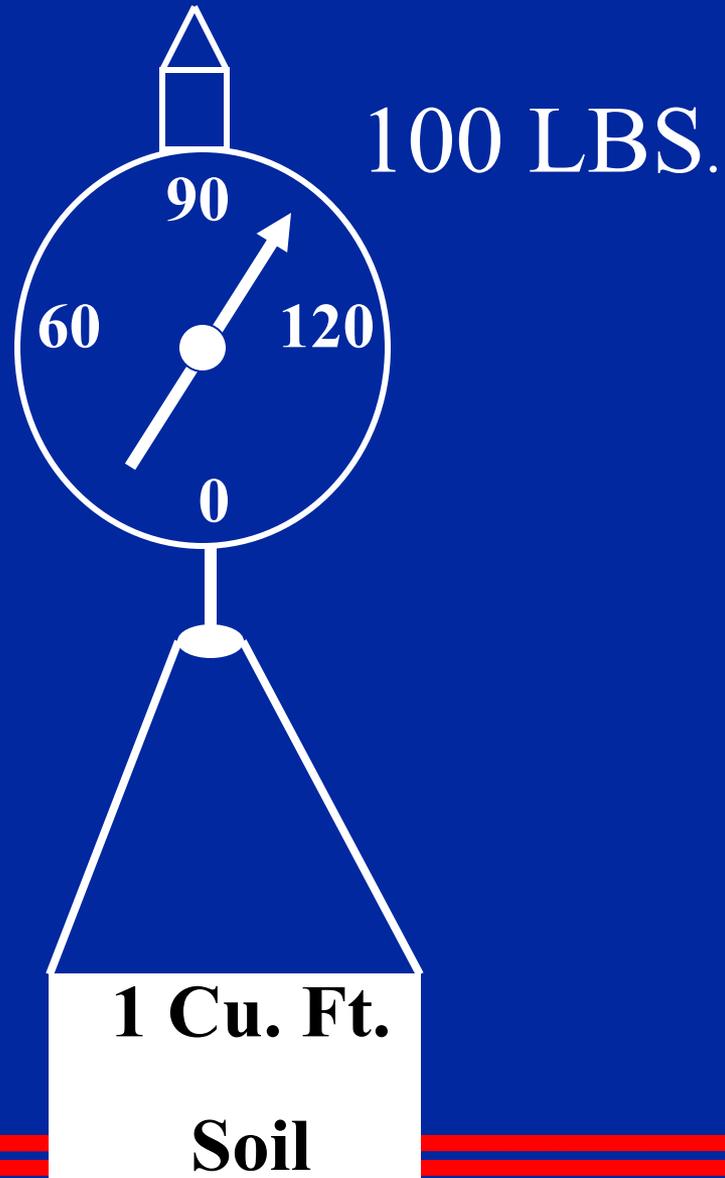
Soil is Extremely Heavy

- One cubic yard of soil weigh = 2700 lbs.
- 3ft x 3ft x 3ft = 27 cu. ft.
- “Average” cave-in = 1 to 3 cu. yds.
- Wet soil, rock soil, or rock is usually heavier.



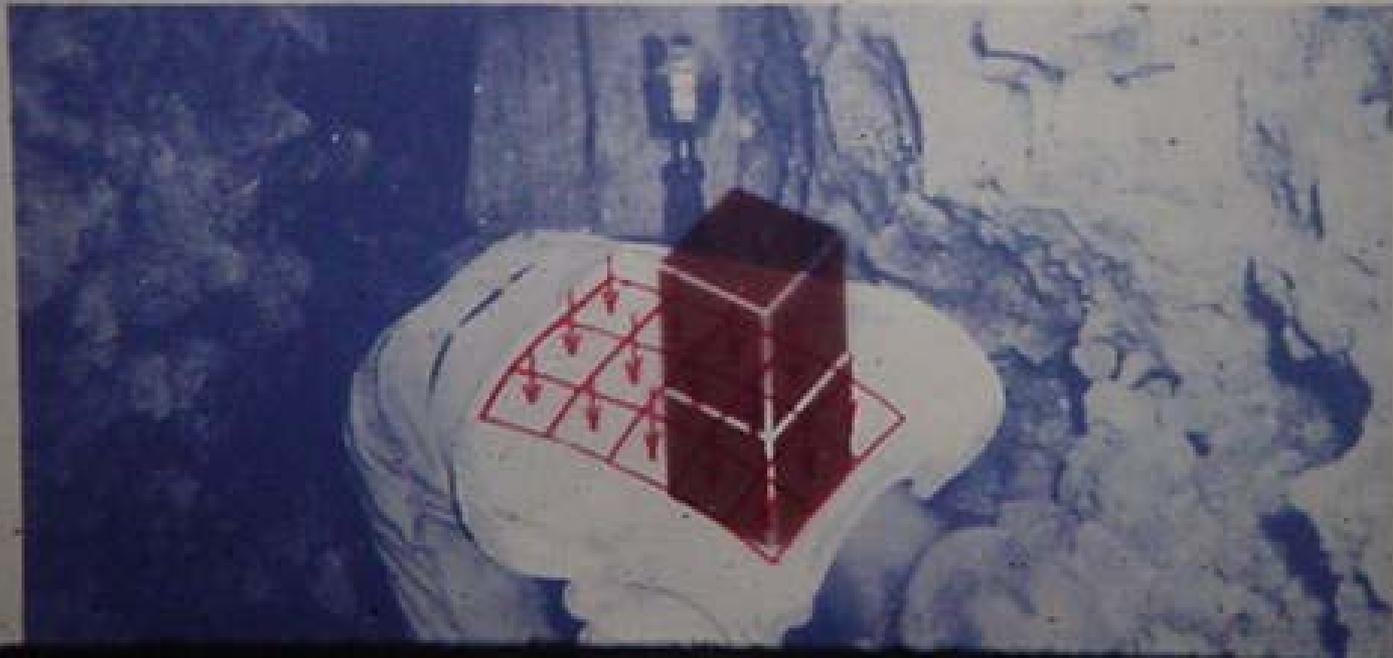


Average cave-in



A MAN WORKING IN A TRENCH.
HIS BACK MEASURES 30" x 18".

IF COVERED WITH 2 FEET OF SOIL (WEIGHING 100 ^{lbs.}/_{cu. ft.}),
EACH 6" x 6" AREA MUST SUPPORT 50 POUNDS OF SOIL.
EACH SQUARE FOOT OF HIS BACK MUST SUPPORT 200 POUNDS.
HIS ENTIRE BACK MUST SUPPORT 750 POUNDS.







Why should you Shore?

- I DO NOT SHORE because some governmental agency says I must.
 - I DON'T shore because I can get fined.
 - I shore because I want to keep on living.
 - **AND SO SHOULD YOU!**
- 



OSHA Regulations

- **29 CFR 1926 Subpart P Excavations**
1926.650, 651, 652
 - **Appendix A, B, C, D, E, & F**
- **Effective March 5, 1990**





Shoring is not Required

- When the excavation is entirely in stable rock.
 - When the excavation is less than 5 FEET in depth and the examination of the ground by a competent person provides no indication of a POTENTIAL cave-in.
- 



SHORING

- (Shoring system) which means a structure such as metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
 - System includes support systems, sloping or benching, shield systems, and other systems that provide necessary protection.
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OSHA reference

- OSHA refers to it as a **PROTECTIVE SYSTEM**.
 - A methods of protecting employees from cave-ins from materials that could fall or roll from an excavation face or into an excavation or from the collapse of adjacent structures.
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Drag Box



Tight Sheeting (Steel)



Excavation as a Confined Space

- Excavation must be checked, when oxygen deficiency (atmospheres containing less than 19.5%) or a hazardous atmosphere exists or reasonably be expected to exist, such as in excavation in areas where hazardous substances are stored nearby.
 - The atmosphere in the excavation shall be tested before employees enter excavation greater than 4 feet in depth.
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Excavation as a Confined Space

- **When controls are used that are intended to reduce the level of atmosphere contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.**
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OSHA Violations

- SERIOUS - are those in which there is substantial probability that death or serious physical harm could result and the employer knew or should have known of the hazard.
 - WILLFUL - are those committed with an intentional disregard of, or plain indifference to, the requirements of the OSH Act and regulations.
- 



Egregious Cases

- For repeated willful instances of regulatory violations
 - First repeated fine is Doubled
 - Twice repeated fine is Quintupled
 - Area Director determines that it is appropriate to achieve the necessary deterrent effect, penalty may be by multiplied by 10.
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PECO has been cited & fined



*Will your organization be
cited & fined.*

**Do you see a OSHA
Compliance officer?**





*You can also face
Criminal Prosecution*





*Knowledge & Good Work
Practices Avoid Encounters with
OSHA Representatives*





Competent Person

- One who is capable of identifying existing or predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous, to employees and who has the authorization to take prompt corrective measures to eliminate them.
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SEE ANYTHING WRONG?





Duties of Competent Person

- 1. Conduct presite review to develop a job plan that ensures a safe, efficient job process.
 - 2. Perform inspections of equipment and trench conditions at the start of each shift or as needed by changing conditions.
 - 3. Remove employees from hazardous conditions and effect all changes necessary to ensure safety.
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Duties of Competent Person

- 4. Categorize soil conditions and conduct visual and manual tests to determine stability of soil and surrounding trench conditions.
 - 5. Maintain on-site records of protection systems
 - 6. Examine all equipment to verify conditions.
- 



Duties of Competent Person

- 7. Determine the appropriate protection system and oversee installation.
 - 8. Verify that a competent person designs ramps and walkways for employees.
 - 9. Verify a competent person, qualified in structural design designs equipment ramps.
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Duties of Competent Person

- ◉ 10. Hold tailboards with crew before trenching and shoring, and as needed.
- ◉ 11. Assures that emergency rescue equipment is available to meet existing or potential conditions.





Duties of Competent Person

- ◉ 12. Monitor use of water removal equipment..
 - ◉ 13. Test for oxygen presence and air quality in excavations deeper than 4 feet, as necessary.
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Duties of Competent Person

- 14. Consult with Registered Professional Engineer (RPE) for trenches over 20 feet, specially designed shoring, bracing or underpinning or when excavation endangers nearby structures
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What constitutes a Competent Person

- Must have had specific training in and knowledgeable about -
 - Soil analysis
 - The use of protective systems
 - The requirements of this standard
 - Knowledge & Authority
- 



Soil Classifications

- ◌ Stable Rock
 - ◌ Class A
 - ◌ Class B
 - ◌ Class C-60
 - ◌ Class C
- 



Soil Classifications

- ◌ STABLE ROCK - natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.





Soil Classifications

- CLASS A - cohesive soils with an unconfined compressive strength of 1.5 ton per square foot or greater





Soil Classifications

- CLASS B - cohesive soil with an unconfined compressive strength greater than 0.5 but less than 1.5 ton per square foot.
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Soil Classifications

- CLASS C-60 - is a moist, cohesive soil or a moist dense granular soil which does not fit into Type A or Type B, and is not flowing or submerged.
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Soil Classifications

- CLASS C-60 This material can be cut with near vertical sidewalls and will stand unsupported long enough to allow the shoring to be properly installed.
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Soil Classifications

- CLASS C-60 Check list to help Competent Person determine if job site soil conditions fit into C-60 soil classification.





Soil Classifications

- CLASS C - cohesive soil with an unconfined compressive strength of 0.5 or less ton per square foot.



What Type of Soil???



Changing Soil Conditions

- Fractured rock, fissured
 - Frozen ground
 - Thawed ground
 - Traffic vibrations
 - Heavy equipment near top of trench
 - Weather
 - Sunlight, Rain, Snow,
- 



Sloping and Benching

- **Class A** **1 = 3/4**
 - **Class B** **1 = 1**
 - **Class C** **1 = 1 1/2**
 - **A short term maximum allowable slope (open less than 24 hours)**
 - **Over 20 feet Registered Professional Eng.**
- 



Sloping and Benching Example

- You excavate to 5 feet in depth.
 - Class C Soil - $7\frac{1}{2}$ feet each side gives you a minimum 17 feet opening.
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REMEMBER

- It is not only UNSAFE but ILLEGAL to work in an excavation that should be shored.
 - People get killed because of
 - Ignorance
 - Carelessness
- 



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