

Hazards of Excavations Outline

1. Overview

- a. Identify the characteristics of a trench
- b. Review excavation related fatality reports
- c. Define definitions of different components of trenches
- d. Identify hazards of the excavations
- e. Role of a Competent Person
- f. Identify protective measures
- g. Understand employee rights

2. Identify the characteristics of a trench

- a. Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters). Is large enough for a worker to enter it, and
- b. An excavation is any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.

3. Review excavation related fatality reports

- a. U.S. Bureau of Labor Statistics (BLS) data show that 271 workers died in trenching or excavation cave-ins from 2000 through 2006.

4. Definitions

- a. Excavations: a man-made cut, cavity, trench, or depression formed by earth removal.
- b. Trench: a narrow excavation. The depth is greater than the width, but not wider than 15 feet.
- c. Shield: a structure able to withstand a cave-in and protect employees.
- d. Shoring: a structure that supports the sides of an excavation and protects against cave-ins.
- e. Sloping: a technique that employs a specific angle of incline on the sides of the excavation. The angle varies based on assessment of impacting site factors.

5. Identify hazards of the excavations

- a. The greatest risk from excavations is cave-ins.
- b. Other risks while working inside or near an Excavation include:
 - i. Water
 1. Causes the sides to become unstable
 2. Cave-ins
 3. Drowning hazard
 4. Electrocution hazard if electrical equipment present
 5. Inspect trenches following a rainstorm or other water intrusion

- ii. Inhalation hazards
 - 1. Carbon Monoxide
 - a. Bonds with the cells hemoglobin
 - i. 50 times tighter than oxygen
 - ii. 200 times stronger than oxygen
 - 2. Work done in the excavation
 - a. Painting
 - b. Welding
 - c. Other activities that may affect the atmosphere
- iii. Lack of oxygen
 - 1. Normal oxygen in the room – approximately 21% (will vary upon elevation and other factors).
 - a. Oxygen Deficient Atmosphere $\leq 19.5\%$
 - b. Oxygen Enriched Atmosphere $\geq 23.5\%$
 - 2. Oxygen can be displaced by:
 - a. Different gasses and compounds in the trench and surrounding area.
 - b. Work performed in the trench.
 - 3. Oxygen can be absorbed by:
 - a. Rust is the oxidization of metal.
 - b. Chemical processes in the trench.
- iv. Underground utilities
 - 1. Water
 - 2. Electrical
 - a. Electrocutation hazard- 75 mA can cause cardiac arrest.
 - 3. Natural Gas
 - a. Explosion hazards- high pressures are used to transport natural gas through underground lines.
 - 4. Always locate lines before you begin excavations and ensure all lines uncovered are supported properly.
- v. Equipment
 - 1. Can cause inhalation hazards
 - a. Carbon Monoxide
 - 2. Fall into trench
 - a. If the trench is unseen use barriers to prevent equipment from getting to close.
 - 3. Can cause a cave-in
 - a. Moving earth equipment
 - b. Vibrations from equipment
- vi. Spoils close to the edge
 - 1. Spoil piles need to be located at least 2 feet away from the edge of the excavation, and it may need to be further away depending on conditions.
 - a. Causes extra weight on the trench walls.

- b. Even properly supported trench can be dangerous if spoil can fall into excavation.
 - vii. Falls
 - 1. To ensure the excavation is safe from falls:
 - a. Place a barrier around the excavation to ensure everyone knows where it is
 - b. Place bright colored or reflective tape around to see in low light conditions
 - c. Ensure signs are properly posted to ensure the excavation location is apparent
 - d. Fall protection required at 6'
 - viii. Egress
 - 1. OSHA standards require safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet or deeper.
 - a. Located within 25' of all workers
 - ix. Ergonomics
 - 1. Study of how environmental factors affect the body
 - a. Body mechanics
 - b. Using equipment
 - c. Right tool for the job
 - d. Job rotation
 - e. Repetitive motion injuries
 - x. Temperature extremes
 - 1. Cold Stress
 - a. Cold stress occurs by driving down the skin temperature and eventually the internal body temperature (core temperature).
 - b. This may lead to serious health problems, and may cause tissue damage, and possibly death.
 - 2. Heat Stress
 - a. From heat rash and heat cramps to heat exhaustion and heat stroke. Heat stroke can result in death.
 - b. Requires immediate medical attention.

6. Role of a Competent Person

- a. OSHA standards require that employers inspect trenches daily and as conditions change by a competent person before worker entry to ensure elimination of excavation hazards.
- b. Competent Person - one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

7. Identify protective measures

- a. Four main types of protection are:
 - i. Shield - can be permanent or portable. Also known as trench box or trench shield.
 - ii. Shoring - such as metal hydraulic, mechanical or timber shoring system that supports the sides
 - iii. Sloping - form sides of an excavation that are inclined away from the excavation
 - iv. Benching - excavating the sides of an excavation to form one or a series of horizontal levels or steps
- b. Sloping
 - i. Inclining the trenching material away from the excavation, so in case of a cave in the material won't fall from the sides crushing workers inside the excavation. Factors to take into account:
 1. Soil type
 2. Materials adjacent to excavation
 3. Work done around excavations
 4. Water
 5. Weather
- c. Shielding
 - i. Shields are engineered structures that take into account the trenches many hazards, and minimizes the hazards of material falling into the excavation and injuring the occupants inside. Some of the factors to consider with shields are:
 1. Depth of cut
 2. Weather
 3. Water
 4. Material to be used in trench
 5. Other operations in the vicinity
 6. Spoil piles
- d. Shoring
 - i. Installing engineered supports directly to the walls of the excavation, it is designed to prevent soil movement. Factors to consider when using this protective system:
 1. Soil type
 2. Strengths of support system
 3. Water
 4. Weather
 5. Work done around excavation
- e. Benching
 - i. Benching is the act of cutting shelves into the sidewalls of the excavation to ensure if there is a cave-in the trench material will not cause harm to the worker. Things to take into consideration with this protective system:
 1. Soil type

2. Weather
3. Water
4. Other operations onsite

8. Employee rights and responsibilities

- a. Employee rights and responsibilities
 - i. To assure safe and healthful working conditions for working men and women
 - ii. By authorizing enforcement of the standards developed under the Act
 - iii. By assisting and encouraging the States in their efforts to assure safe and healthful working conditions
 - iv. By providing for research, information, education, and training in the field of occupational safety and health
- b. A right to
 - i. A safe and healthful workplace
 - ii. Know about hazardous chemicals
 - iii. Information about injuries and illnesses in your workplace
 - iv. Complain or request hazard correction from employer
 - v. File a confidential complaint with OSHA to have their workplace inspected.
 - vi. Receive information and training about hazards, methods to prevent harm, and the OSHA standards that apply to their workplace. The training must be done in a language and vocabulary workers can understand.
 - vii. Get copies of their workplace medical records.
 - viii. Participate in an OSHA inspection and speak in private with the inspector.
 - ix. File a complaint with OSHA if they have been retaliated or discriminated against by their employer as the result of requesting an inspection or using any of their other rights under the OSH Act.
 - x. File a complaint if punished or discriminated against for acting as a “whistleblower” under the additional 20 federal statutes for which OSHA has jurisdiction.
- c. Whistleblower Protection
 - i. OSHA's Whistleblower Protection Program enforces the whistleblower provisions of more than twenty whistleblower statutes protecting employees who report violations of various workplace safety,

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