EXCAVATION/TRENCHING: OSHA 1926 SUBPART P Greater Lafayette Area Safety Council-May 17, 2023

August

DEFINITIONS

- An **excavation** is a man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal.
- **Trenches** are narrow, underground excavations that are deeper than they are wide and are no wider than 15 feet.







Excavation





TRENCHES





CASE STUDY: EXCAVATION



Accident Review

Fatal Facts # 59

August

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- Falling wall adjacent to excavation
- Laborer first day on job
- Find water line in trench next to wall
- Trench 3 feet 10 inches deep
- Wall collapses and kills worker



- * Why do you think this incident occurred?
- * What could have prevented the worker from being killed?
- * How might this injury impact the worker and families daily life?

EXCAVATION SAFETY CONSIDERATIONS

- Heavy equipment (swing radius)
- Mobile equipment/vehicle traffic
- Vibrations
- Weather
- Adjacent structures
- Demolition





EXCAVATION SAFETY BASICS

- 5 Feet requires Cave-in protection
- 4 Feet requires Entry and Egress
- Air monitoring-oxygen deficiency/toxic fumes
- Walkway
- Inspection
- Falling objects





OTHER EXCAVATION HAZARDS

- Water accumulation-when water is present in an excavation it is extremely hazardous to enter
- Access/egress
- Emergency Rescue





EXCAVATION SAFETY STAND-DOWN

Excavation Safety Stand-down

Make a plan to protect workers and prevent accidents

April 10-14, 2023







#2. Call to Action I appreciate the opportunity to collaborate with all of you in this excavation/trenching exercise. We will work together to reduce and eliminate excavation/trenching incidents.

#1. THE STORY

- <u>https://fox59.com/indiana-news/workerdies-after-ground-collapses-near-newlydug-trench-in-shelby-county/</u>
- Worker dies after ground collapses near newly dug trench in Shelby County
 - by: Izzy Karpinski
 - Posted: Feb 28, 2022 / 07:55 AM EST





#6. EXCAVATION AND TRENCHING HAZARDS & PROTECTION

COMMON HAZARDS

- Trench cave ins and collapses
- (Trench inspections daily or when conditions change)
- Falling loads
- Falls into excavations
- Hazardous atmospheres in trenches

PROTECTION METHODS

- Slopes: Ensure trench walls are benched, Supports: Shore walls to brace them
- Shields: Protect workers from sidewalls with trench boxes.
- Store materials at least 2 feet away from edge of excavation
- Worker must have a safe and secure means of egress in trenches 4 feet deep or more
- Workers must wear proper respiratory protection equipment (atmospheric/air testing under certain circumstances)



CAVE-INS







#6. EXCAVATION AND TRENCHING HAZARDS & PROTECTION

COMMON HAZARDS

- Locating buried facilities
- Shock hazards
- Diverting water from the excavation site



PROTECTION METHODS

- Call 811-public and private locate
- Cable Locating devices can use radar or radio frequency technology to help pinpoint the location of existing underground cables
- Dewatering techniqueswellpoints, sump pumping, eductor wells, and deep wells



EXCAVATION SITE EVALUATION PLANNING

- Before beginning excavation:
 - Evaluate soil conditions
 - Determine the safety equipment needed
 - Develop Health and Safety Plan (HASP)
 - Develop Job Safety Analysis (JSAs)/Activity Hazard Analysis (AHAs)
 - Create Excavation Checklist
 - Add Dig Permit



MAKING A CONSTRUCTION SITE SAFETY PLAN



EXCAVATION SITE EVALUATION PLANNING

- Before Beginning Excavation:
 - Construct protective systems
 - Test for low oxygen, hazardous fumes and toxic gases
 - Provide safe in and out access
 - Contact utilities



TEST FOR HAZARDOUS ATMOSPHERE

- Test excavations more than four feet deep before an employee enters the excavation for:
 - Oxygen deficiency
 - High combustible-gas concentration
 - High levels of other hazardous substances (Carbon monoxide, Benzene, Hydrogen Sulfide)





DEVELOP HEALTH AND SAFETY PLAN (HASP)

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JOB SAFETY ANALYSIS (JSA) OR ACTIVITY HAZARD ANALYSIS (AHA) FOR EXCAVATION/TRENCHING





EXCAVATION CHECKLIST

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EXCAVATION CHECKLIST

Company:			Project:	
Trench Depth:	Length/Width:	Type of Protective S	ystem:	
Site location/Descripti	on (weather, soil type, etc.):			
Signature of competer	nt persons:		Date:	Time:

Yes No N/A	Excavation
	Excavations and protective systems inspected by competent person daily before start of work.
	Competent person has authority to remove workers from excavation immediately.
	Surface encumbrances supported or removed.
	Necessary PPE, including hard hats, worn by all employees.
	Spoils, materials, and equipment set back a minimum of two feet from edge of excavation.
	Barriers provided at all remote excavations, wells, pits, shafts, etc.
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PUBLIC AND PRIVATE UTILITY LOCATES

- Public in Indiana call 811 to schedule, typically 48-72 hours before the start of work.
- Private locate- utilizing Ground Penetrating Radar (GPR) an/or Electromagnetic Induction (EM).
- GPR mapping method is excellent for excavations, trenching, areas where Underground Storage Tanks (USTs) are present and larger ground disturbing work areas where the location of utilities are not known.





EXCAVATION HAZARDS- LOCATING AND MARKING FACILITIES

- Establishing excavation points
- Locate and mark buried utilities with color codes





LOCATE OWNERSHIP UTILITY TRANSFER POINTS





EXCAVATIONS (1926.650-.652) OSHA MOST CITED FY2022



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EXCAVATION SIMULATOR VR ON STEAM





Source: https://store.steampowered.com/app/1526380/Excava tor_Simulator_VR/

TRENCH DESIGN AND SAFETY

- Trenches 5 feet (1.5 meters) deep or greater require a protective system unless the excavation is made entirely of stable rock.
- Trenches 20 feet (6.1 meters) deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer.



TRENCH SAFETY

- 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 (1.22 meters) or deeper is required.
- These devices (ladders, steps, ramps, or other safe means of exit) must be located within 25 feet (7.6 meters) of all workers.



TRENCHING SAFETY CHECKLIST

TRENCHING SAFETY CHECKLIST

BEFORE YOU BEGIN THE WORKDAY

- Competent person inspected excavation and adjacent areas
- Hard hats, safety vests, and visible clothing are worn by all employees
- Warning systems are established and put into place
- All utility lines are located and obviously labeled
- Protective systems are inspected and working as intended
- Nothing is near the excavation that shouldn't or doesn't have to be there





Source:

https://www.bigrentz.com/blog/trenchingsafety

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TRENCHING SAFETY

PROTECT WORKERS IN TRENCHES

Prevent trench collapses and save lives:

SLOPE or bench trench walls,

SHORE trench walls with supports, or

SHIELD trench walls with trench boxes









DESIGNING A CAVE IN PROTECTIVE SYSTEM

- Factors:
 - ➢Soil classification
 - ≻Depth of cut
 - ➤Water content of soil
 - Changes due to weather and climate
 - >Other operations in the vicinity



CAVE IN PROTECTIVE SYSTEMS

• Sloping involves cutting back the trench wall at an angle inclined away from the excavation.





• Shoring requires installing aluminum, hydraulic, or other types of supports to prevent soil movement and cave-ins.





• Shielding protects workers by using trench boxes or other types of supports to prevent soil cave-ins.





• Benching





• Sloping





SOIL TYPES

- Stable Rock Examples include Granite or Sandstone
- Type A Clays
- Type B Silts
- Type C gravels and sands



ALLOWABLE SLOPES

- Stable Rock Vertical walls 90 degrees
- Type A soil- ³/₄:1 or 53%
- Type B soil 1:1 or 45%
- Type C soil 1.5:1 or 34%



TRENCHING AND EXCAVATION RECOMMENDATIONS

- Keep heavy equipment away from trench edges
- Keep surcharge loads at least 2 feet (0.6 meters) from trench edges
- Know where underground utilities are located
- Test for low oxygen, hazardous fumes, and toxic gases



TRENCHING AND EXCAVATION RECOMMENDATIONS

- Excavations and Trenches must be inspected daily and as conditions change by a competent person prior to worker entry to ensure elimination of excavation hazards.
- Inspect trenches at the start of each shift
- Inspect trenches following a rainstorm.
- Do not work under raised loads.

EXCAVATION- COMPETENT PERSON

- Must have had specific training in and be knowledgeable about:
 - Soils classification
 - The use of protective systems
 - The requirements of the standard
- Must be capable of identifying hazards and authorized to immediately eliminate them

INSPECTIONS OF EXCAVATIONS

- A competent person must make daily inspections of excavations, areas around them and protective systems:
 - Before work starts and as needed
 - After rainstorms, high winds or other occurrence which may increase hazards
 - When you can reasonably anticipate an employee will be exposed to hazards

INSPECTIONS OF EXCAVATIONS

- If a competent person finds evidence of a possible cave-in, indications of failure of protective systems, hazardous atmospheres or other hazardous conditions:
 - Exposed employees must be removed from the hazardous area.
 - Employees may not return to work on the excavation until the necessary precautions have been taken.

EXCAVATION ERRORS

AVAILABLE RESOURCES

- Resources:
 - https://www.cdc.gov/niosh/topics/trenching/default.html
 - https://www.osha.gov/news/newsreleases/national/07142022
 - <u>https://www.osha.gov/sites/default/files/enforcement/directives/CPL-02-00-161_0.pdf</u> (National Emphasis Program on Trenching and Excavation)
 - <u>https://naspweb.com/blog/common-trenching-and-excavation-hazards/</u>
 - <u>https://811.safedigindiana.com</u>

QUESTIONS?THANK YOU!

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