On-site Wastewater Training
For Tribal Environmental Programs

Excavation Safety

Stroud, Oklahoma
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Brought to you by EPA Region 6 with Cherokee Nation, Chickasaw Nation, Choctaw Nation, Eastern Pottawatomie Tribe, and OSU Cooperative Extension
OSHA 1926 Subpart P - Excavations

- Top 5 Citations by Osha

1) 652(a)(1) Employee protection in excavations
2) 651(k)(1) Inspections by competent person
3) 651(c)(2) Egress from trench excavations
4) 651(j)(2) Protection from falling/rolling materials
5) 651(k)(2) Competent Person inspection- employees removed from hazard
Definitions:

• **Competent Person:** a person who is capable of identifying existing and predictable hazards in the surrounding, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

**Also has specific training in and knowledge about:**
* Soils analysis
* The use of protective systems
1926.651 - General Requirement

- Surface encumbrances
- Underground installations
- Access and egress
- Exposure to vehicular traffic
- Exposure to falling loads
- Warning system for mobile equipment
1926.651 - General Requirements

- Hazardous atmosphere
- Protection from hazards associated with water accumulation
- Stability of adjacent structures
- Protection of employees from loose rock and soil
- Inspections
- Fall protection
Surface Encumbrances

• Shall be removed or supported if they create a hazard to the employees working in the area.

Examples: Light posts, signs, power lines, telephone poles.
Underground Utilities

- Must determine location of utilities underground. (gas lines, electric lines, etc.)
- Exact location must be made by safe and acceptable means.
- While excavation is open, underground utilities shall be protected, supported or removed to safeguard employees.
Access and Egress

• Structural ramps and runways designed by competent person.
• Need cleats on each side for traction and shall be of uniform thickness.
• Ladders, stairways, or ramps every 25 feet in trenches 4 feet or deeper.
Exposure to falling loads

- Employees shall not work under equipment which will be moving loads or digging equipment.
- Operators may remain in cabs of vehicles being loaded or unloaded if cab is properly equipped with protection (1926.601).
Exposure to vehicular traffic

• Employees exposed to public vehicular traffic shall be provided with high visibility and reflective vests or other suitable garments.
Warning system for mobile equipment

• When mobile equipment is working around excavations and does not have good sight.

Need to have:

Barricades, hand or mechanical signals, or stop logs.
Hazardous Atmospheres

• Testing and controls.
  * oxygen deficiency (less than 19.5%)
  * provide needed PPE
  * provide ventilation

• Emergency rescue equipment
  * safety harness and line, etc.
  * separate life line for employee and equipment
Protection from hazards associated with water accumulation

• Employees shall not work in excavations where water is present or accumulating unless precautions are taken.
• Equipment and employees monitored by competent person.
• Means should be taken to reduce natural water runoff from entering the excavation.
Stability of adjacent structures

• Underpinning, shoring, bracing, or other support system needed to support adjoining structures.

• unless stable rock

• approved by P.E. that will not affect structure.

• Sidewalks, pavements etc.
Protection from loose rock or soil

• Scaling the face of the excavation.
• Protective barricades.
• Keeping excavated materials 2 feet back from edge.
• Retaining devices.
Inspections

- Daily inspections of excavations, adjacent areas and protective systems by competent person.
- Also after rainstorms and other hazard increasing occurrence.
- If problems found employees should be removed from excavation until corrected.
Fall protection

• Walkways over excavations shall conform to osha standards with guardrails if over 6’.
• Wells, pits, and other shafts shall be equipped with physical protection or backfilled upon completion.
1926.652 - Requirements of protection systems.

- Protection of employees in excavations
- Design of sloping and benching systems
- Design of support systems, shield systems, and other protective systems
- Materials and equipment
- Installation and removal of support
- Sloping and benching systems
- Shield systems
Protection of employees in excavations

- Protected by adequate protective system

Unless:

- Excavation in stable rock
- Excavation less than 5’ and examination by competent person shows no potential for cave-ins
Design of sloping and benching systems.

- Selected and constructed by employer
- Option 1 - Allowable configurations and slopes (not steeper than - 1 1/2 horizontal to 1 vertical)
- Option 2 - Determination of slopes and configurations using Appendices A and B
- Option 3 - Designs using other tabulated data
- Designed by Registered P.E.
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Design of support systems, shield systems, and other protective systems

- Selected and constructed by employer
- Option 1 - Designs using Appendices A, C and D
- Option 2 - Designs using manufacturer’s data
- Option 3 - Designs using other tabulated data
- Option 4 - Designs by a registered P.E.
Materials and equipment

- Materials and equipment free from defects
- Follow manufacturers directions
- If damaged competent person must evaluate condition for later use.
- If he cannot assure safety, must be removed from service.
- Must be approved by P.E. before used again
Installation and removal of support

• Members securely connected together
• Installed safely to prevent cave-ins, collapses, or striking/injuring employees
• Designed for expected loads
• Removal begins at bottom to top
• Backfilling performed as supports removed
• No excavations more than 2 feet below
Sloping and benching systems

- Employees shall not be allowed to work on face of slope/bench with employees below.
- Unless, the employees below are protected from falling, rolling, or sliding materials or equipment.
Shield systems

- Designed to support intended loads
- Installed to restrict lateral movement
- Employees protected when entering/exiting
- Employees not allowed in shield when being installed, removed, or moved vertically
- Excavation up to 2 feet deeper than shield.
Appendix A - Soil Classification

- Type A - (clay, silty clay, sandy clay, clay loam, caliche)
- Type B - (angular gravel, silt, silt loam, sandy loam)
- Type C - (gravel, sand, loamy sand)
Appendix B - Sloping and Benching

• Table B-1 - Maximum allowable slopes

<table>
<thead>
<tr>
<th>Type</th>
<th>Slope Ratio</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Stable Rock</td>
<td>Vertical (90)</td>
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<tr>
<td>Type A</td>
<td>3/4:1</td>
<td>53</td>
</tr>
<tr>
<td>Type B</td>
<td>1:1</td>
<td>45</td>
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<tr>
<td>Type C</td>
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<td>34</td>
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</table>

• See footnotes on Table B-1 in appendix
Additional Appendixes

• Appendix C - Timber shoring
• Appendix D - Aluminum Hydraulic shoring
• Appendix E - Alternatives to timber shoring
• Appendix F - Selection of protection systems
Questions and Answers
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