



**SECTION 4**    **CHAPTER 20**  
**TRENCHING/SHORING/EXCAVATION**

**Purpose**                      To heighten affected employees awareness of the surface and sub-surface hazards of trenching, shoring, and excavation.

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**Scope**                      All affected employees

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**In this chapter**

<b>Topic</b>	<b>See Page</b>
Underground Installations	2
Access and Egress	2
Exposure to Vehicular Traffic	2
Exposure to Falling Loads	2
Hazardous Atmospheres	3
Protection From Hazards Associated with Water Accumulation	3
Competent Person	4
Safe Practices	4
Design of Sloping and Benching Systems	5
Design of Support, Shield, and Other Protective Systems	8
Materials and Equipment	9
Installation and Removal of Support	10

**Underground installations**

The location of underground installations shall be determined before excavation.

**Access and egress**

Trench excavations shall have ramps, ladders, stairs, etc; the means of egress must be within 25 feet of lateral travel for employees.

**Exposure to vehicular traffic**

An employee exposed to vehicular traffic shall be provided with, and shall wear warning vests (or other suitable garments) marked with or made of reflective or highly visible material.

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**Exposure to falling loads**

Employee shall:

- not be permitted underneath loads handled by lifting or digging equipment
  - be required to stand away from any vehicle being loaded or unloaded to avoid being struck by an spillage or falling materials
  - may remain in the cabs of vehicle being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations
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### **Hazardous atmospheres**

To prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the program will include the following requirements:

- Where oxygen deficiency or a hazardous atmosphere exists, or reasonably expected to exist, the atmosphere in the excavation shall be tested before employees enter excavations greater than 4 feet.
- Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. The precautions include providing proper respiratory protection or ventilation for all employees.
- Adequate precautions shall be taken such as providing ventilation, to prevent employee exposure, to an atmosphere containing a concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.
- When controls are used that is intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure the atmosphere remains safe.

For more information see *Entering a Confined Space* and *Respiratory Protection*.

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### **Protection from hazards associated with water accumulation**

Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. Inspections shall be made by a Competent Person before work begins.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

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**Competent person**

**Definition** - “Competent Person” means 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.

**Titles and Duties** - Each area yard will designate the Competent Person. The following is a partial list of their responsibilities and duties:

- Daily inspections of excavations, the adjacent areas, and protective systems (JSA) for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions.
- Inspection shall be conducted prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rain storm or other hazard increasing occurrence. These inspections are only required when employees exposure can be reasonably anticipated.
- When and if the Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area immediately and until the necessary precautions have been taken to ensure their safety.
- The program requires that prior to allowing re-entry to any area that had been evacuated due to an emergency or hazardous situation, the Competent Person will provide written authorization, including all processes of the abatement.

**Safe practices - fall protection**

Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails shall be installed and have a top edge height of 42 inches above the walking/working level.

**Safe practices - protection of employees in excavations**

Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed except when:

- excavations are made entirely in stable rock; or
- excavations are less than 5 feet in depth and examination of the ground by Competent Person provides no indication of a potential cave-in

Protective systems shall have the capacity to resist without failure all loads that are intended or could be reasonably expected to be applied or transmitted to the system.

## Design of sloping and benching systems

The slopes and configurations of these systems shall be selected and constructed by Yard Management or their designee, and shall be in accordance with the requirements as follows:

### Sloping:

When sloping is used to protect against cave-ins, these options can be chosen for designing sloping systems:

- If a soil classification is not made, then slope the sides of the excavation to an angle not steeper than one and one-half horizontal to one vertical (34 degrees). A slope of this gradation or less is considered safe for any type of soil.
- Use Appendices A and B of 29 CFR 1926, Subpart P to determine the maximum allowable slope and allowable configurations for sloping systems. The soil type must be determined in order to use this option.
- Use other tabulated data approved by a registered professional engineer.
- Have an engineer design and approve the system to be used.

There are a number of exceptions or special cases to these general sloping guidelines, which can be utilized if the conditions meet the exception's requirements. The exceptions and conditions are outlined below:

\* In Type A soil, simple slope excavations which are open 24 hours or less (short term) and which are 12 feet high or less in depth may have a maximum allowable slope of 1/2 horizontal to 1 vertical.

\* In Type A soil, all excavations 8 feet or less in depth which have unsupported vertically sided lower portions must have a maximum vertical side of 3.5 feet.

\* In Type A soil, excavations over 8 feet but less than 12 feet in depth with unsupported vertically sided lower portions must have a maximum allowable slope of 1H:1V and a maximum vertical side of 3.5 feet.

\* In Type A soil, excavations 20 feet or less with vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4 H:1V. The support or shield system must extend at least 18 inches above the top of the vertical side.

\* In Type B soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1H:1V.

\* In Type C soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a

maximum allowable slope of 1-1/2 H:1V.

\* When an excavation contains layers of different types of soils, the general sloping requirements do not apply. The excavation must be sloped according to Appendix B-1.4 of 29 CFR 1926, Subpart P.

**Benching:**

When benching is used to protect against cave-ins, these options can be chosen for designing benching systems:

- Use Appendices A and B of 29 CFR 1926, Subpart P to determine the maximum allowable slope and allowable configurations for benching systems. The soil type must be determined in order to use this option.
- Use other tabulated data approved by a registered professional engineer.
- Have an engineer design and approve the system to be used.

There are a number of exceptions or special cases to these general benching guidelines, which should be utilized by your company if the conditions meet the exception's requirements. The exceptions and conditions are outlined below:

\* In Type A soil, simple slope excavations which are open 24 hours or less (short term) and which are 12 feet high or less in depth may have a maximum allowable slope of 1/2 horizontal to 1 vertical.

\* In Type A soil, all excavations 8 feet or less in depth which have unsupported vertically sided lower portions must have a maximum vertical side of 3.5 feet.

\* In Type A soil, excavations over 8 feet but less than 12 feet in depth with unsupported vertically sided lower portions must have a maximum allowable slope of 1H:1V and a maximum vertical side of 3.5 feet.

\* In Type A soil, excavations 20 feet or less with vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4H:1V. The support or shield system must extend at least 18 inches above the top of the vertical side.

\* In Type B soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1H:1V.

\* In Type C soil, all excavations 20 feet or less which have vertically sided lower portions shall be shielded or supported to a height at least



18 inches above the top of the vertical side. The excavation shall have a maximum allowable slope of 1-1/2 H:1V.

\* When an excavation contains layers of different types of soils, the general sloping requirements do not apply. The excavation must be sloped according to Appendix B-1.4 of 29 CFR 1926, Subpart P.

Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when other employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

**Design of support, shield, and other protective systems**

The company protects each employee in an excavation from cave-ins during an excavation by an adequate protective system designed in accordance with OSHA standards. Protective system options include proper sloping or benching of the sides of the excavation; supporting the sides of the excavation with timber shoring or aluminum hydraulic shoring; or placing a shield between the side of the excavation and the work area. Gravity Oilfield Services has the following standard operating procedures regarding protective support systems for excavations, in accordance with safe practices and procedures and OSHA excavation regulations:

- If the excavation is made entirely of stable rock, then no protective system is necessary or used.
- If the excavation is less than 5 feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in, then no protective system is necessary or used.
- If the excavation is less than or equal to 20 feet in depth, then a Competent Person chooses the most practical design approach (that meets required performance criteria) for the particular circumstance, and/or a registered professional engineer designs all protective systems for use in the excavation.
- If the excavation is more than 20 feet in depth, then have a registered professional engineer design all protective systems for use in the excavation.

Shield controls and requirements include the following:

- Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
- Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.
- Employees shall be protected from the hazards of cave-in when entering or exiting the areas protected by shields.
- Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- Excavations of earth material to a level not greater than 2 feet below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.



## Material and equipment

Materials and equipment used for protection systems shall be:

- free from damage or defects that might impair their proper function
- used and maintained in a manner that is consistent with recommendations of the manufacturer; and
- arranged in a manner that will prevent employees from exposure to hazards

When material or equipment that is used for protective systems is damaged, the Competent Person shall examine the material or equipment and evaluate its suitability for continued use. **IF** the Competent Person cannot assure the material or equipment is able to support the intended loads or is otherwise unsuitable for safe use, **THEN** such material or equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

## Installation and removal of support

### General:

- Members of support systems shall be securely connected together to prevent sliding, falling, kick-outs, or other predictable failure.
- Support systems shall be installed and removed in a manner that protects employees from cave-in, structural collapses, or from being struck by members of the support system.
- Individual members of support systems shall not be subjected to loads exceeding those loads for which they were designed to withstand.
- Before temporary removal of individual members begin, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
- Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.
- Back-filling shall progress together with the removal of support systems from excavations.

### Additional Requirement:

Excavation of material to a level no greater than 2 feet below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system. **Installation of a support system shall be closely coordinated with the excavation of trenches.**