

4123:1-5-26 Trenches and excavations.

(A) General requirements.

(1) Utility companies and municipally owned utilities shall be contacted and advised of proposed work prior to the start of actual excavation. Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered and, if so, where such underground installations are located.

(2) An employee shall not be required to use mechanical digging or trenching equipment within three feet of an energized underground electrical conductor whose location is known, unless the conductors are protected by concrete ducts or equivalent protection.

(3) Where trenches or excavations are made in locations adjacent to backfilled trenches or excavations or where trenches or excavations are subjected to vibrations from any source, such as railroad or highway traffic or the operation of machinery, additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins.

(4) Undercutting of the exposed faces of trenches or excavations is prohibited unless the exposed faces of such undercutting are supported by one or more of the methods prescribed for the support of exposed faces of trenches.

(5) Material placement.

(a) Excavated material or other material shall be retained a minimum of twenty-four inches from the top edge of the trench or excavation.

(b) As an alternative to the clearance prescribed in paragraph (A)(5)(a) of this rule, the employer shall use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the trench or excavation.

(6) Wells, pits, shafts etc.

(a) All wells, pits, shafts, etc., shall be barricaded or covered.

(b) Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

(B) Trenches.

(1) The exposed faces of all trenches more than five feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. (See table 26-1 to this rule.)

(2) Sides of trenches in unstable or soft material, five feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. (See table 26-1 and table 26-2 to this rule.)

(3) Sides of trenches in hard compact soil, including embankments, shall be shored or otherwise supported when the trench is more than five feet in depth and eight feet or more in length. In lieu of shoring, the sides of the trench above the five-foot level shall be sloped to preclude collapse, but shall not be steeper than a one-foot rise to each one-half-foot horizontal.

(4) Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the trench.

(5) Minimum requirements - trench shoring.

(a) Minimum requirements for trench bracing and shoring shall be in accordance with table 26-2 to this rule. The vertical planks in the bracing system shall extend at least to the top of the trench face.

(b) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:

$$S = \frac{1300 - 20L}{D}$$

maximum ratio : $\frac{L}{D} = 50$

Where:

L = length, unsupported, in inches.

D = least side of the timber in inches.

S = allowable stress in pounds per square inch of cross section.

(6) When employees are required to be in trenches four feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than twenty-five feet of lateral travel.

(7) When bracing or shoring of trenches is required, such bracing and shoring shall be carried along with the excavation.

(8) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

(9) Portable trench boxes, safety cages or sliding trench shields may be used for the protection of employees in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench and shall extend at least to the top of the trench face.

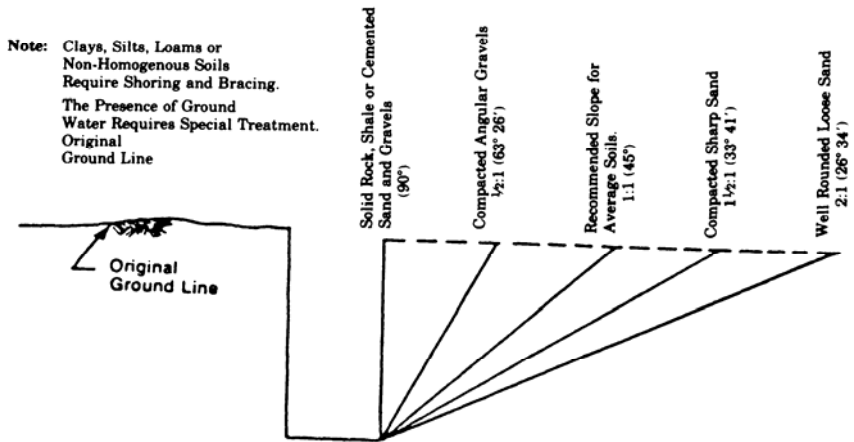
(10) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly, and, in unstable soil, employees shall clear the trench before pulling out the jacks or braces with ropes.

(C) Excavations.

The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means. (See table 26-1 and table 26-2 to this rule.)

Table 26-1.

**APPROXIMATE ANGLE OF REPOSE
FOR SLOPING OF SIDES OF EXCAVATIONS**



**Table 26-2.
TRENCH SHORING—MINIMUM REQUIREMENTS**

Depth of trench Feet	Kind or condition of earth	Size and spacing of members												
		Uprights		Stringers		Cross braces ¹						Maximum spacing		
		Minimum dimension Inches	Maximum dimension Feet	Minimum dimension Inches	Maximum dimension Feet	Width of trench		Vertical		Horizontal				
		Up to 3 feet	3 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 15 feet	15 feet	Vertical Feet	Horizontal Feet	Vertical Inches	Horizontal Inches			
5 to 10	Hard, compact	3x4 or 2x6	6	2x6	4x4	4x6	4x6	6x6	4	4x6	6x6	6x8	4	6
	Likely to crack	3x4 or 2x6	3	2x6	4x4	4x6	4x6	6x6	4	4x6	6x6	6x8	4	6
10 to 15	Soft, sandy, or filled	3x4 or 2x6	Close sheeting	4x6	4x4	4x6	6x6	6x8	4	4x6	6x8	8x8	4	6
	Hydrostatic pressure	3x4 or 2x6	Close sheeting	6x8	4x4	4x6	6x6	6x8	4	4x6	6x8	8x8	4	6
15 to 20	Hard	3x4 or 2x6	4	4x4	4x6	6x6	6x8	8x8	4	4x6	6x8	8x8	4	6
	Likely to crack	3x4 or 2x6	2	4x4	4x6	6x6	6x8	8x8	4	4x6	6x8	8x8	4	6
Over 20	Soft, sandy, or filled	3x4 or 2x6	Close sheeting	4x6	4x6	6x6	6x8	8x10	4	4x6	6x8	8x10	4	6
	Hydrostatic pressure	3x6	Close sheeting	8x10	4	4x6	6x6	6x8	4	4x6	6x8	8x10	4	6
15 to 20	All kinds or conditions	3x6	Close sheeting	4x12	4	4x12	6x8	8x8	4	4x12	6x8	8x10	4	6
Over 20	All kinds or conditions	3x6	Close sheeting	4x8	4	4x12	8x8	8x10	4	4x12	8x8	10x10	4	6

¹ Trench jacks may be used in lieu of, or in combination with, cross braces. Shoring is not required in solid rock, hard shale, or hard slag. Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

- (2) Supporting systems, i.e., piling, cribbing, shoring etc., shall be substantially constructed to prevent cave-in and sliding.
- (3) Excavations sloped to the angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.
- (4) Sides, slopes, and faces of all excavations shall be made safe by scaling, benching, barricading, rock bolting, wire meshing, or equally effective means.
- (5) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions. (See table 26-2 to this rule for proper dimensions.)
- (6) Excavations below the level of the base of the footing of any foundation or retaining wall are prohibited, except in hard rock, unless the wall is underpinned and appropriate precautions are taken to ensure the stability of adjacent walls.
- (7) If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, braced or sloped as necessary to resist the extra pressure due to such super-imposed loads.
- (8) When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed.
- (9) Where employees or equipment are required to cross over excavations, walkways or bridges with standard guardrails shall be provided.

Effective: 1/1/86