

OSHA RULES AND REGULATIONS
October 31, 1989

Subpart P – Excavations

1926.650 Scope, application, and definitions applicable to this subpart.

Shield (shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

1926.651 General Requirements

(2) *Means of egress from trench excavations.* A stairway, ladder, ramp or other means of egress shall be located in trench excavations that are 4 feet (1.22m) in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

1926.652 Requirements for protective systems.

(3) *Option (3)—Designs using other tabulated data.*

- (i) Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts.
- (ii) The tabulated data shall be in written form and include the following:
 - (A) Identification of the parameters that affect the selection of a protective system drawn from such data;
 - (B) Identification of the limits of use of the data;
 - (C) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

(iii) At least one copy of the tabulated data, which identifies the registered professional engineer who approved the data shall be maintained at the jobsite during construction of the protective system. After that time the data may be stored off the jobsite, but a copy of the data shall be made available to the Secretary upon request.

(4) *Option (4) – Design by a registered professional engineer.*

- (i) Support systems, shield systems, and other protective systems not utilizing Option 1, Option 2, or Option 3, above, shall be approved by a registered professional engineer.
- (ii) Designs shall be in written form and shall include the following:
 - (A) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and
 - (B) The identity of the registered professional engineer approving the design.
- (iii) At least one copy of the design shall be maintained at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the Secretary upon request.

(D) *Materials and equipment.*

- (1) Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.
- (2) Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent with the recommendation of the manufacturer, and in a manner that will prevent employee exposure to hazards.
- (3) When material or equipment that is used for protective systems is damaged, a 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 suitable 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.

(2) **Additional requirements for support systems for trench excavations.** (i) Excavation of material to a level no greater than 2 feet (.61 m) 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.

(g) **Shield systems** --- (1) General.

- (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
- (ii) 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.
- (iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
- (iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) **Additional requirements for shield systems used in trench excavations.** Excavations of earth material to a level not greater than 2 feet (.61 m) 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.

Appendix A to Subpart P

Soil Classification

Type A means : cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam, and in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- (i) The soil is fissured; or
- (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- (iii) The soil has been previously disturbed; or
- (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H: 1V) or greater; or
- (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

- (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- (ii) Granular cohesion less soils including: angular gravel (similar to crushed rock), silt, silt loam and, in some cases, silty clay loam and sandy clay loam.
- (iii) Previously disturbed soils except those, which would otherwise be classes as Type C soil.
- (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- (v) Dry rock that is not stable; or
- (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V) but only if the material would otherwise by classified as Type B.

Type C means:

- (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- (ii) Granular soils including gravel, sand, and loamy sand; or
- (iii) Submerged soil or soil from which water is freely seeping; or
- (iv) Submerged rock that is not stable; or
- (v) Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H: 1V) or steeper.

Registered Professional Engineer

means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.



OSHA REQUIREMENTS

Contact regional office for free copy of Safety & Health Regulations, Part 1926, Subpart P – Excavations, Trenching and Shoring

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(617) 565-7164

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Dallas, TX 75202
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PACIFIC)
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San Francisco, CA 94105
(415) 744-6670

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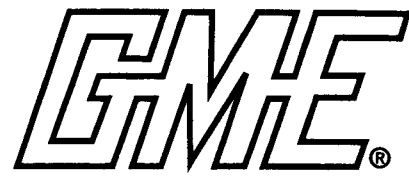
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**TABLE B-1
MAXIMUM ALLOWABLE SLOPES**

SOIL OR ROCK TYPE	MAX. ALLOWABLE SLOPES (H:V) FOR EXCAVATIONS LESS THAN 20 FEET
Stable Rock	Vertical (90)
Type A	3/4: 1 (53)
Type B	1:1 (45)
Type C	1½:1 (34)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:V (63) is allowed in excavations in Type A soil that are 12 feet (3.67m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67m) in depth shall be 3/4H:V (53).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.



TRENCH SHIELD SOIL CLASSIFICATION SYSTEM
(As recommended by the Trench Shoring and Shielding Association in compliance
with OSHA's 29 CFR Part 1926 Subpart P Excavations and Trenches)

Type A

Stiff Cohesive Soil
25 PSF per foot of depth

Description:

Clay, silty clay, sandy clay, clay loam with unconfined compressive strength of 1.5 ton per square foot or greater.
See note (1)

Type B

Med Cohesive to Granular Soil
45 PSF per foot of depth

Description:

Clay with unconfined compressive strength greater than 0.5 TSF, but less than 1.5 TSF. Cohesionless gravel, silt, silt loam or sandy loam.
See note (2)

Type C*

Soft Cohesive to Saturated Soil
60 PSF per foot of depth

Description:

Clay with unconfined compressive strength less than 0.5 TSF, saturated sand, clay or fractured rock that is not stable.
See note (3)

- (1) Not Type A if: fissured, subject to vibration, previously disturbed or part of a sloped layered system where layers dip into excavation on a slope of four horizontal to one vertical (4H: 1V) or greater.
- (2) Previously disturbed soils may be Type B unless they would be classes as Type C. Soil that meets requirement of Type A but is subject to vibration of fissured may be Type B. Dry rock that is not stable or soil that is part of a sloped layered system where layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H: 1V) are Type B if material would otherwise be classified as Type B.
- (3) Soil in a sloped layered system where layers dip into the excavation on a slope of four horizontal to one vertical (4H: 1V) or steeper may be Type C. Saturated soils or soils from which water is freely seeping but is not standing in the trench.

**** Conditions more severe would require dewatering or sealing four sides of the excavation and pumping the trench. Such severe conditions would require the services of a soils engineer to establish the design pressure. Consult the manufacturer for pressures exceeding tabulated values.***

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