REQUIREMENTS FOR PROTECTIVE SYSTEMS

Each employee in an excavation shall be protected from cave-ins by an adequate protective system except when excavations are less than five feet in depth and examination of the ground by a competent person provides no indication of a potential cave in.

SOIL CLASSIFICATION

Type A Soil
Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in granular materials: clayey clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

Type B Soil
Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (144 kPa) but less than 1.5 tsf (144 kPa).

Type C Soil
Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay and sandy clay.

Test Blows Per Foot Cohesive Soil Granular Soil
Phoenix Tucson
0-4 <10 C - Soft A - Very Hard 15-30 10 C - Very Loose
4-8 >30 B - Medium A - Hard 40 C - Medium
8-15 40 B or A - Soft C - Loose 60 C - Very Dense
15-20 40 B or A - Soft C - Very Loose

DISCLAIMER: For use by the trained and knowledgeable “competent person” only. Refer to the appropriate requirements of your local city, county state, federal regulations and/or manufacturer’s tabulated engineering for further clarification.

Visual Tests
a) Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the operating excavation, and the soil taken as samples from excavated material.
b) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
c) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
d) Observe the sides of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
e) Observe the area adjacent to the excavation and the excavation itself for evidence of water accumulation, surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
f) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Manual Tests
Manual analysis of soil samples is conducted to determine qualitative as well as quantitative properties of soil and to provide more information in order to classify soil properly.
a) Plasticity: Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without breaking, the soil is cohesive.
b) Dry strength: If the soil is dry and crumbling on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken with difficulty, it may be clay in any combination with gravel, sand or silt. If the soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
c) Thumb penetration: The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, this test can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure.

OTHER AVAILABLE OPTIONS USING SOIL REPORTS

- Blows Per Foot
- Cohesive Soil
- Granular Soil

Blows Per Foot
0-4 >30 C - Soft A - Very Hard
4-8 30 C - Very Loose
C - Medium
B - Medium A - Hard
8-15 30 B or A - Soft C - Loose
C - Very Dense
8-15 30 B or A - Soft C - Medium

*Could be Type A if hardpan or cementation exists.
SLOPING & BENCHING

TYPE A SOIL

Open 24 Hours or Less

SLOPING & BENCHING

TYPE B SOIL

TYPICAL INSTALLATIONS

ALUMINUM HYDRAULIC SHORING

TEN COMMANDMENTS OF TRENCHING

1. A competent person must inspect the trench prior to the start of work and prior to employee entrance.
2. Proper sloping or trench protection must exist at 5 feet or deeper.
3. Spoils must be at least 2 ft from edge of trench.
4. 25 ft is the maximum distance a person can be from a ladder or ramp.
5. Ladders must be tied off.
6. All trench shields must extend to ground surface.
7. A trench shield must be within 2 ft of bottom of the trench.
8. Class B soils must be sloped 1.5:1.
9. Class C soils must be sloped 1.5:1.