

Trenching—Soil types

Explain dangers

An unstable trench can collapse, killing or injuring workers. Trench stability is affected by a number of factors such as soil type, moisture content, vibration, surcharge, previous excavation, existing foundations, and weather.

Time is also a critical factor. Some trenches will remain open for a long period, then suddenly collapse for no apparent reason.

Soil type is one of the most important factors affecting trench stability. In a single trench, soil properties can vary widely from top to bottom or along its length. Even hard soil may contain faults in seams or layers that make it unstable when excavated.

Identify controls

The foreperson or supervisor on a project must be knowledgeable about soil types and plan protection accordingly.

There are four general types of soil—from dry, dense, and hard (Type 1) to wet, muddy, and unable to support itself (Type 4).

TYPE 1 SOIL

- Hard, very dense. You can only penetrate it with difficulty by using a small sharp object.
- Low natural moisture content, high degree of internal strength.
- No signs of water seepage.
- Need mechanical equipment to excavate it.

When excavated, the sides of the trench will appear smooth and shiny and will remain vertical with no water released from the trench wall.

If exposed to sunlight for several days, the walls will lose their shiny appearance but remain intact. If exposed to rain or wet weather, the soil may break down along the edges.

TYPE 2 SOIL

- Very stiff, dense. You can penetrate it with moderate difficulty by using a small sharp object but a pick can be driven in relatively easily. It can be easily excavated with a backhoe or by hand with some difficulty.

- Low to medium natural moisture content, medium degree of internal strength.
- Has a damp appearance after it is excavated.

The sides of a trench will remain vertical for several hours. After that, exposure to air and sunlight will cause tension cracks to appear. The soil will begin cracking and splaying into the trench.

TYPE 3 SOIL

- Stiff to firm, compact to loose in consistency. May be backfill or previously excavated soil.
- Signs of surface cracking and water seepage.
- When dry, it may run easily into a well-defined conical pile.
- Low degree of internal strength.

When dry, the sides of the trench will not stand vertically and will cave in to a natural slope (45°). When wet, the soil will stand for a short period. However, it dries quickly and chunks or slabs will start to fall into the trench.

TYPE 4 SOIL

- Soft to very soft, very loose in consistency, very sensitive to vibration and motion.
- Any disturbance significantly reduces its natural strength.
- Runs or flows easily unless completely supported before excavation.
- Almost no internal strength.
- Wet or muddy.
- Exerts substantial fluid pressure on its supporting system.

The sides of the trench must be supported and contained in order to excavate to any significant depth.

Demonstrate

With your crew, examine soil samples on site and determine the soil type.

Demonstrate any tests you know for determining different types of soil.