

# TerranearPMC Safety Share

## Week of September 8, 2015 – Excavations and Trenches

What is the difference between an excavation and a trench? Both are made-made cuts in the earth, formed by earth-moving equipment, such as backhoes, front-end loaders, and – of course – excavators. The fact is, a trench is a specific type of excavation. According to OSHA’s definition, a trench is a narrow excavation in relation to its length. However, a trench cannot have a width greater than 15 feet (where the width is measured at the bottom; not at the top or ground surface). No specific dimensions are given to further define a trench, such as width to length or depth ratios.

Whether you find yourself working in or around an excavation or trench, these sites pose many dangerous scenarios. Hazards associated with excavations/trenches include falling or subsiding soils, resulting in suffocation and/or crushing, materials and equipment falling on workers, personnel falling from equipment or into the excavation, while encountering toxic, flammable and oxygen-deficient environments.

Experts in the field of excavations and trenches will tell you that cave-ins are the most dangerous and prevalent hazards. OSHA has gathered data throughout the years and has recognized that the fatality rate for work in/around excavations is 112% higher than general construction. The reasons for such an alarming statistic are based on an overall failure by the entity that is in charge of work in an excavation to: 1) not install protective systems, 2) failure to inspect excavations prior to entry, 3) placing spoils (excavated materials) in a safe/controlled location, and, 4) not providing safe access and egress points.

The OSHA regulation for excavations can be found in the General Construction standards, 29 CFR 1926, Subpart P (“Excavations”), paragraphs 650 (definitions) through 652 (“Requirements for Protective Systems”). This standard makes it mandatory for any work site with an excavation to assign a *competent person*. This person needs to be someone with the expertise (based on training, education and/or experience) who is capable to recognize existing as well as predictable hazards associated with the excavation. A competent person has the authority to take prompt action to eliminate such hazards.

OSHA notes a number of ways to control cave-ins. These are the practices of sloping, benching and shoring. The first method, sloping is the process of excavating at an angle. Depending on the soil stability will determine the degree of slope. The more stable the soil, the steeper the grade may be. For instance, “stable rock” is naturally solid mineral matter where the excavation side can be vertical, remaining intact while exposed. Soil type “A” is not as stable as “stable rock” where the soil has a compressive strength of 1.5 ton per square foot (tsf) or greater. Such soils are generally clays (i.e. silty clay, sandy clay, clay loam, etc.) Type A soils can be sloped at a ratio of 1 foot rise to ¾ foot run. Type B soils have a compressive strength of greater than 0.5 tsf (but less than 1.5 tsf) and may be sloped at an angle of 45 degrees (1 foot rise to 1 foot run). Type B soils are generally granular cohesionless soils, such as angular gravel or crushed rock, silt, silt loam and sandy loam. Type C soils have a compressive strength of 0.5 tsf or less and are sloped with a 1 foot rise to 1 ½ foot run. These soils are generally gravel, sand, and loamy sand.



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Another type of protective system is benching. Similar to sloping, the sides of the excavation are sloped, using the same angle and compressive strength criteria; however, the side of the excavation form one or a series of steps, usually with vertical or “near-vertical” surfaces between each step-level.

All soil classifications have specific exceptions and/or caveats to their design criteria, such as when different soil types are found at separate depths or when an excavation shall be opened for 24 hours or less and have a depth of less than 12 feet (in this case the slope can be a steep as 1-foot rise to ½-foot run). It is the responsibility of the employer (or designee) to determine the proper slope of an excavation, as well as to construction and configuration. Appendix A of 29 CFR 1926, Subpart P provides details for proper configurations and depths for sloping.

Maximum depths for sloping are typically 20 feet; however, once this depth is reached, OSHA requires a registered professional engineer (PE) to design the excavation. While there are many types of disciplines within the category of registered professional engineer, civil and structural engineers are typically considered to be the most qualified to determine excavation stability. Nevertheless, OSHA does not specify any particular engineering discipline for this qualification (it should be noted that a registered professional engineer has the responsibility to perform work for which he/she is qualified to perform; performing working work outside one’s field of expertise can result in serious legal and professional consequences). PE’s are also required to design mechanical protective systems, such as shielding systems or hydraulic systems (which are designed to stabilized excavation sides to protect personnel when stationed inside the excavation), whenever a system has NOT been via manufacturer’s specifications.

One of the most prevalent hazards for persons working in an excavation is storing equipment and materials too close to the edge of an excavation. OSHA requires that spoils and equipment shall be placed no closer than two feet from the excavation edge. Meanwhile equipment that needs to enter an excavation shall be accessed through a structural ramp that is designed by a competent person (not a PE). While working in an excavation where the depth is four feet or greater, a viable means of egress, such as a stairway, ladder or ramp, needs to be located so that there is no more than a travel distance of 25 feet.

The competent person is also responsible for the daily safety and health of personnel working in excavations. This person needs to assess the excavation every shift for which personnel will be assigned to work. The competent person must also evaluate the excavation after being subject to the runoff of heavy rains to determine stability. Monitoring for hazardous atmospheres is also a main duty of the competent person. Excavations can trap gases and vapors caused by the scheduled work activities that use chemicals while creating a flammable atmosphere as well as an oxygen-deficient environment. Therefore, the competent person is required to monitor the air in all excavation greater than four feet in depth prior to persons entering.

**To vilify a great man is the readiest way in which a little man can himself attain greatness.**

Edgar Allan Poe

