Excavation, Shoring
& Trenching Policy

Purpose
To establish safety procedures associated with excavation/trenching, concentrating on the safeguards necessary to prevent cave-ins and other inherent hazards associated with this type of work activity.

Scope
This procedure applies to all City of Brentwood employees exposed to excavation/trenching hazards while performing work.

Responsibilities

Supervisors

It is the supervisor's responsibility to comply with and ensure that this procedure is followed; that appropriate equipment for safe operations is provided; that employees are familiar with the requirements of this procedure and the hazards associated with trenching and excavation; and operations are conducted in a safe manner and within applicable local, state and federal regulations.

Employees

Employees are responsible for complying with this procedure.

Definitions

Competent Person – One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Excavation – Any man made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Five Foot Rule – The depth at which a trench or excavation requires cave-in protection. Excavations less than 5 feet deep require cave-in protection if examination of the ground by a competent person reveals potential for cave-in.

Trench – The depth of hole is greater than the width

Unconfined Compressive Strength of Soil - The load per unit at which soil will fail during compression. This measurement can be determined via

- Laboratory testing.
- Use of pocket penetrometer or sheer vane.

  Thumb penetration testing.

Locating Underground Utilities

- Underground utility marking (sewer, telephone, gas, electric, cable) must be requested in accordance with local, state or federal regulation prior to the commencement of any excavation.
- Expiration of locates will vary from state to state. It is the responsibility of the supervisor to be aware of the expiration date to ensure compliance.
- State requirements: there is a tolerance zone of 24" on either side of a locate mark that prohibits digging with powered equipment to expose the marked facility.

Heavy Equipment Transport

- Equipment must be positively secured, usually by properly rated chains or web straps, when transported to and from a job site via a transport vehicle. This includes backhoes, trench boxes, ladders, and all other equipment and tools. Generally, equipment weighing in excess of 10,000 lbs. must be secured by 4 points of attachment. Bungee cords and rubber straps are not approved for cargo securement.
- Extreme caution must be exercised when driving a backhoe to a job site.

Safety Related Equipment At Job Site

- Fire Extinguishers.
- First Aid Kits.
- Safety Data Sheets (SDS' s) for any chemicals that are at the jobsite.
- Trench Log Excavation Safety Permit.
- Manufacturer's Tabulated Data for any shoring or shielding equipment (ex: trench boxes, aluminum hydraulic shoring), that will be used to protect workers from cave-ins. Installation and use of the cave-in protective equipment must be in accordance with the manufacturer's tabulated data.

Personal Protective Equipment

- Hard Hat use is required during all excavation activities unless employee is in control pulpit (cab) of a backhoe that is protected by an overhead guard/cage.
- Steel or Composite Toed Safety Shoes.
- High - Visibility safety apparel that meets the Performance Class 2 or 3 requirements of ANSI 107-2004, or equivalent revisions, and labeled as such, is required for all workers within the road right-of-way.
- Eye/Face Protection, in the form of safety glasses whenever the possibility of airborne projectiles could come in contact with an employee's eyes and/or face.
- Hearing Protection (ear plugs or muffs) whenever an employee is exposed to high noise levels exceeding 85 decibels (ex: working adjacent to an air compressor in use, jack hammer, or saw).

Work Zone Traffic Control

- Must be utilized at all work sites in or near the street in accordance with the requirements of the Manual on Uniform Traffic Control Devices (MUTCD).
- Must be utilized for short duration work, intermediate and long duration work.
- Must be clearly visible to vehicular traffic as it approaches the work site.

Working Near Overhead Power Lines

A minimum distance of 10 feet must be maintained between workers, equipment, and energized overhead power lines up to 50kV (50,000 volts). For overhead power lines exceeding 50kV, the required clearance distance is 10 feet plus 4 inches for every 10kV above 50kV.

- Use a "spotter" to ensure the 10 feet clearance (plus an additional 4 inches for every 10kV above
- 50kV) is maintained during operation of digging and lifting equipment.
- If the minimum clearance distance cannot be maintained, contact the owner utility and have them de-energize the power line(s) and provide grounding equipment as needed.
- If the owner utility does provide grounding equipment, do not stand near the grounding location for intentionally grounded vehicles when contact with overhead wires is possible. Use insulation and barriers to protect employees from the grounding area.
- When needed to guide or steady a hoisted load, non-conductive tag lines shall be used to keep employees clear of the load should it swing or fall.

Classification/Types of Soil

Stable Rock – natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

- ***Type A*** – Cohesive soils with unconfined compression strength of 1.5 tons per square foot or greater (example: most types of clay).
- ***Type B*** – Cohesive soil with unconfined compression strength of greater than 0.5 tons per square foot but less than 1.5 tons per square foot (example: angular gravel, similar to crushed rock, rock that is not stable).
- ***Type C*** – Cohesive soil with unconfined compression strength of 0.5 tons per square foot or less (example: sand).
- Important: soil classification must be reevaluated following rain storms or other events which could weaken the soil.

Cave-In Protection

This is the most important safeguard associated with digging activities. It is of utmost importance to protect employees from cave-in and the deadly power of soil as it collapses. One cubic yard of soil is equivalent to approximately 2,700 pounds of force.

Types of Cave-In Protection

- ***Sloping*** – method of protecting employees by excavating to form sides of an excavation/trench that are inclined away from the hole. This is referred to as the "angle of repose". Sloping systems must be designed in accordance with OSHA requirements.
- ***Benching*** – method of protecting employees by excavating the sides of an excavation/trench to form one, or a series of, horizontal levels or steps, usually with vertical or near vertical surfaces between levels. Benching systems must be designed in accordance with OSHA requirements and is not allowed in Type C soil.
- ***Shoring*** – an engineered system, usually comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such systems are designed specifically to support the sidewalls of an excavation. Plywood or sheeting used must be approved by the manufacturer and specified in the tabulated data.
- ***Trench Shields/Box*** – a structure that is able to withstand the forces imposed on it by a cave-in and protect employees within the structure. Shields can be permanent structures or can be designed to be portable and move along as work progresses. Additionally, shields can be either pre-manufactured or job built in accordance with manufacturer's specifications.

- ***Combination*** –utilizing any two or more of the aforementioned methods to ensure sufficient cave-in protection.

Angle(s) of Repose for Sloping Protection

- Type A Soil: ¾’ (horizontal) to 1’ (vertical)
- Type B Soil: 1’ (horizontal) to 1’ (vertical)
- Type C Soil: 1.5’ (horizontal) to 1’ (vertical)

Means of Egress Within Excavations

- A stairway, ladder, ramp or other safe means of egress must be located in trenches/excavations that are 4’ in depth or greater and must be located within 25’ of lateral travel for employees.
- Ladders, when used as the means of egress, must extend a minimum of 3’ above the top edge of the excavation and must be secured from tipping.

Two (2) Foot Rule

All spoils (soil removed from hole when excavating), equipment and tools must be kept a minimum distance of 2’ from the edge of the trench/excavation (or further away when required by the shoring/shielding equipment tabulated data).

Surface Encumbrances, Adjacent Structures and Access Around the Excavation

- Surface encumbrances and adjacent structures (ex: street lights, poles, trees, street signs) that are located so as to create a hazard shall be removed and/or supported.
- Fall Protection-where applicable: walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails which comply with 1926. 502(b) shall be provided where walkways are 6 feet (1.8m) or more above lower levels.

Exposure to Falling Loads

No employee shall be permitted underneath loads handled by lifting, hoisting, or digging equipment.

Warning Systems for Mobile Equipment

When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear view of the edge, a warning system shall be utilized such as barricades, hand signals, and/or stop logs.

Hazardous Atmospheres

Where oxygen deficiency or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or where hazardous substances are stored nearby, the atmospheres in the excavation shall be tested before employees enter excavations greater than four feet in depth.

Water Accumulation

Employees shall not work in excavations in which there is accumulated water or in which water is accumulating, including runoff from rain storms, unless adequate precautions (pumping activities) have been taken to protect employees. The competent person has the responsibility to monitor water levels and water removal equipment.

Inspections

- Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the competent person. These inspections shall be performed prior to the start of work and as needed throughout the job. Inspections shall also be made after every rainstorm or other hazard increasing event.
- Where the competent person finds evidence of a situation that could result in possible cave-in, indications of failure of protective systems, hazardous atmospheres or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Miscellaneous Trench Shield Requirements

- Trench shields and other manufactured shoring/shielding equipment must be installed in accordance with Manufacturer's Tabulated Data
- Trench shields shall be installed in a manner to restrict lateral or hazardous movement of the shield in the event of a sudden soil shift. Lateral/horizontal movement can be negated by backfilling soil to lessen the gap between the sides of the shield and the excavation edge
- Excavation of material to a level no greater than 2' below the bottom of a support system shall be permitted when allowed by the tabulated data.

Twelve (12) Foot Rule

Public Works management will contract out all excavations that exceed 12' in depth.

Twenty (20) Foot Rule

All excavation cave-in protection systems must be designed by a professional engineer when the excavation exceeds 20' in depth.

After Hour Protection

Unless prohibited, all trenches/excavations must be either backfilled or plated in accordance with local or state regulations. In addition, traffic cones, warning lights, barricades, caution/warning tape (or a combination of two, three, or all methods) may be required as additional safe guards to protect the excavated area.

Training

- All City employees working in trenches/excavations must receive initial, excavation safety training before engaging in excavation work activity(s).
- Objective testing will be part of the training curriculum to ensure participants comprehend the training provided.
- Refresher training will be conducted regularly and when new hazards are introduced, procedures have changed, or the employee's actions or behavior evidences a need for refresher training. Depending on their needs, certain operating units may require this training annually.