

EXCAVATION POLICY (TRENCHING & SHORING)

1.0 PURPOSE

The purpose of this policy is to establish requirements and procedures for the safe operations around excavation work throughout the City of Wilson. This policy will meet or exceed all requirements set forth by 29 CFR 1926.650, 651, 652.

2.0 ORGANIZATIONS AFFECTED

This policy applies to all Departments of the City of Wilson and visiting contractors working on behalf of those departments.

3.0 DEFINITIONS

- 3.1 **"ACCEPTABLE ENGINEERING PRACTICES"** means those requirements which are compatible with standards of practice required by a registered professional engineer.
- 3.2 **"BENCHING"** (benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.
- 3.3 **"CAVE-IN"** means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
- 3.4 **"COMPETENT PERSON"** means 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.
- 3.5 **"CROSS BRACES"** means the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either upright or wales.
- 3.6 **"EXCAVATION"** means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
- 3.7 **"FACES"** or sides means the vertical or inclined earth surfaces formed as a result of excavation work.
- 3.8 **"FAILURE"** means the breakage, displacement, or permanent deformation of a structure member or connection so as to reduce its structural integrity and its supportive capabilities.

- 3.9 **"HAZARDOUS ATMOSPHERE"** means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful may cause death, illness, or injury.
- 3.10 **"KICKOUT"** means the accidental release or failure of a cross brace.
- 3.11 **"PROTECTIVE SYSTEM"** means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
- 3.12 **"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.
- 3.13 **"SHIELD"** (Trench Box) 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."
- 3.14 **"SHORING"** means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
- 3.15 **"SLOPING"** means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.
- 3.16 **"TRENCH"** means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimensions measured from the forms or structure to the side of the excavation to 15 feet (4.6m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

4.0 **GENERAL REQUIREMENTS**

The following are requirements necessary for all excavations within the City and County:

- 4.1 All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
- 4.2 The estimated location of all utility installations, such as sewer, telephone, gas, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

- 4.3 Utility companies, Electric, Gas or property owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of the actual excavation.

NOTE

When utilities or owners cannot respond to a request to locate underground utility installations within 24 hours, or cannot establish the exact location of these installations, the Supervisor on site may proceed, provided the supervisor does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

- 4.4 The estimated location of all utility installations will be determined by a safe and acceptable means.
- 4.5 While excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

NOTE

All excavated spoil and/or equipment shall be placed at least 2 feet from the edge of the excavation. For large spoil or equipment having the possibility of rolling or falling into the excavation, retaining devices will be used to prevent falling into the excavation. If this is not possible, spoil will be placed in dump truck.

- 4.6 Trench boxes will be visually inspected for stress cracks or wear on welds of cross braces prior to installation in excavation.
- 4.7 A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 5 feet or more in depth.
- 4.8 All ladders will be tied off at the top as to prevent movement and extend at least 36 inches from top of excavation while being used in excavation activity.
- 4.9 In addition to hard hats, steel-toed shoes and other necessary personal protective equipment, all employees will wear orange blaze reflectorized warning vests while working in excavations that are exposed to traffic and its hazards.
- 4.10 Inspection of the excavation will be made by the superintendent/supervisor before employees enter, prior to the start of work, and throughout the job. If superintendent/supervisor finds evidence that could result in possible cave-ins, failure of protective equipment, hazardous atmospheres, or other hazardous conditions, exposed employees will be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- 4.11 Excavations will not be left unattended and unprotected. When it is necessary to leave an unattended excavation open during lunch or overnight, it shall be protected with a safety fence, and/or barricades and tape.
- 4.12 The majority of excavations dug by the City employees will be shallow (10 feet or less). However, for deeper excavations or special situations where a vertical wall excavation with shoring box is not possible, supervisors should refer to 29 CFR 1926, OSHA Standards for the

Construction Industry; Appendix B and C to 1926 Subpart P- Shoring and Benching illustrations for further assistance (A copy has been placed at the end of this policy).

- 4.13 The supervisor will perform a soil manipulation test to determine the type of soil composition for all excavations not able to accommodate the use of trench boxes and requiring the use of shoring and/or sloping. (See Appendix A). After the supervisor has determined the type and cohesiveness of soil, Type A, Type B, Type C, Cohesive or non-cohesive, supervisors should refer to 29 CFR 1926, OSHA Standards for the Construction Industry; Appendix B and C to 1926 Subpart P- Shoring and Benching illustrations for further assistance. (See end of policy).

5.0 ATMOSPHERIC TESTING

- 5.1 Atmospheric testing will be performed in all excavations employing shoring and greater than 5 feet in depth and where there is a possibility of a hazardous or toxic atmosphere present (i.e., maintenance on all sewer lines, working around natural gas lines, near landfills). Testing will begin prior to entry and shall be continuous while employees are working within the excavation.
- 5.2 Before an employee enters the excavation where hazardous atmospheres may be present, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:

Between 19.5% - 23.0% Oxygen Less than 10% LFL for Combustible Less than 10 PPM for H ₂ S
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- 5.3 If atmosphere inside an excavation fails to meet any of the three above criteria, space will be ventilated using continuous forced air ventilation. At this time, the excavation will be classified as a permit-required confined space and require a City confined space permit to be filled out and posted at the excavation.

NOTICE

No employee will enter a permitted excavation space until the Oxygen, Combustibles, and Toxic gas readings are below or within required settings.

NOTICE

The use of gas powered equipment (i.e., pipe saw) within excavations will require the use of ventilation equipment to prevent carbon monoxide build-up.

NOTICE

Self-contained Breathing Apparatus will not be worn while working within any permit required excavation for any reason; to include atmosphere testing.

- 5.4 Atmosphere within the permit required excavation will be tested **hourly** and results noted on the Confined Space Permit. If entrants exit the confined space for more than **15 minutes**, the excavation will be **re-tested prior to re-entry**.
- 5.5 If a hazardous atmosphere is detected or a dangerous situation develops:
 - 5.5.1 Each entrant shall leave the excavation immediately;
 - 5.5.2 The space shall be evaluated to determine how the hazardous atmosphere developed; and
 - 5.5.3 Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

6.0 PROTECTION FROM WATER ACCUMULATION

- 6.1 All excavations producing the hazard of water accumulation will be closely monitored by superintendent/supervisor while work is being performed.
- 6.2 Employees will not be allowed into any excavation where there is an accumulation of water (either from water mains or rainwater run off) unless a de-watering pump and an employee proficient in the operation of the pump are in site.

NOTICE

All pumps will be continuously monitored by an employee proficient in its operation throughout the excavation activity.

- 6.3 If necessary, employees working within excavations may be required to wear harnesses and lifelines for added protection. (i.e. deep pits).
- 6.4 Excavations across streams, drainage ditches, or into areas where water accumulates through the natural process of gravity, shall be avoided. If no alternative exists, diversion ditches, dikes, or other suitable means shall be used where needed to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

7.0 STABILITY OF ADJACENT STRUCTURES

- 7.1 Excavations around adjoining buildings, walls, or other structures will be avoided. If no alternative exists, where needed, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

NOTICE

Excavations around adjoining buildings, walls, or other structures will require the authorization and presence of a registered professional engineer throughout the excavation activity.

- 7.2 Excavations below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard shall not be permitted except when:
- 7.2.1 A support system such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
 - 7.2.2 The excavation is in stable rock; or
 - 7.2.3 A registered engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
 - 7.2.4 A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
- 7.3 The registered professional engineer who approves either the above two exceptions will put that authorization in writing and keep that writing near the site throughout the excavation activity.
- 7.4 Sidewalks, pavements, or other structures will not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

8.0 SHIELD SYSTEMS (Trench Boxes)

- 8.1 Trench boxes shall be the primary means of protection for all excavations requiring protective support. **For those excavations deeper than 20 feet or, are difficult to properly use trench boxes, work crews must get permission from the superintendent who will in turn refer to the next section 9.0 for assistance.** Also refer to 29 CFR 1926, OSHA Standards for the Construction Industry; Appendix B and C to 1926 Subpart P-Shoring and Benching illustrations if applicable.
- 8.2 Trench boxes shall not be subjected to loads exceeding those that the system was designed to withstand.
- 8.3 A copy of "Manufacturers Tabulated Data" for each trench box will be present and readily available at each excavation work site where the trench boxes are being used.
- 8.4 Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- 8.5 Trench boxes may be permitted to rest no greater than 2 feet above the floor of the excavation provided the box rests snug into the excavation where the walls of the excavation meet the sides providing no space between the side of the box and the excavation wall.

9.0 INSTALLATION AND REMOVAL OF SUPPORT

NOTE

This section applies to excavation activities that require protection beyond the trench boxes normally used by City work crews. Notice: the use of trench boxes shall be the primary means of protecting employees during excavation activities. If that is not possible, supervisors should refer to 29 CFR 1926, OSHA Standards for the Construction Industry; Appendix B and C to 1926 Subpart P- Shoring and Benching illustrations for further assistance.

- 9.1 Members of support systems shall be securely connected in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
- 9.2 Individual members of support systems shall not be subjected to loads exceeding those that those members were designed to withstand.
- 9.3 Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
- 9.4 Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.
- 9.5 Backfilling shall progress together with the removal of support systems from excavations.

10.0 PERMIT SYSTEM

- 10.1 The Supervisor shall have a Trenching/Excavation and Shoring permit and an Entry Permit from and will complete the permit before beginning any activity where employees:
 - 10.1.1 Will enter trenches or excavations 4 or more feet deep.
 - 10.1.2 Are exposed to the hazard of sliding or cave-ins.
 - 10.1.3 Will be working with their heads below ground surface level.
 - 10.1.4 Where the supervisor or Safety & Risk Manager expresses concern and disallows initial entry or continuing operations takes corrective measures before allowing employees to enter.

- 10.2 The Supervisor will forward the original permit to their Division Head and a copy will be sent to the Management Services Office after all work in areas is complete.
- 10.3 A copy of the Trenching/Excavation Permit has been added to Section 7 of this manual.