1.0 PURPOSE

To provide direction for employee's working in excavations and trenches.

2.0 SCOPE

Excavations five (5) feet or more in depth shall be protected from cave-ins by an adequate protective system. Excavations less than five (5) feet in depth shall be adequately protected when an examination of the ground by a Competent Person provides an indication of a potential cave-in.

The policies and procedures contained in this section are intended to assist in identifying and complying with OSHA Safety Standards. In all cases where there is a difference between specific OSHA standards and the Excavation and Trenching policies set forth in this chapter, the stricter of the two shall apply.

3.0 DEFINITIONS

Bell-bottom pier hole: means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

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; also one who has the authorization to take prompt corrective measures to eliminate them.

Excavation: means any man-made cut, cavity, trench or depression in an earth surface, formed by earth removal.

Hazardous atmosphere: means an atmosphere which, by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic or otherwise harmful, may cause injury, illness or death.

Protective system: means a method of protecting employees from cave-ins, from material that could fall from an excavation face, or from the collapse of adjacent structures.

Registered Professional Engineer: means a person who is registered as a professional engineer in the state where the work is to be performed.

Sheeting: means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shoring (Shoring system): means a structure, such as a hydraulic shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Trench (Trench excavation)**:** 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 the trench is not greater than 20 feet.

4.0 RESPONSIBILITY

A. Departments

Departments shall ensure that employees are trained to recognize potential hazards inherent with excavations and trenches.

B. Supervisors

Supervisors shall ensure that employees working in and around excavations and trenches are adequately protected from the potential hazards associated with excavations and trenches, including falls and/or traffic and shall mandate the wearing of all personal protective equipment required when exposed to the hazards that may be encountered while working in an excavation or trench.

C. Employees

Employees shall follow all safety precautions and direction of the Competent Person when working in or around excavations and trenches. Employees shall wear all personal protective equipment associated with the hazards encountered while working in an excavation or trench.

D. Central Safety Services

Central Safety Services shall provide awareness training for all employees in the City of Tucson that may be required to work in excavations and trenches.

5.0 EDUCATION AND TRAINING

All employees and/or supervisors that will be reasonably expected to enter, perform work or inspect work associated with an excavation or trench excavation shall receive awareness level training from Central Safety Services.

Employees that are designated as the “Competent Person” shall receive Competent Person training as offered or facilitated by Central Safety Services. Employees hired by the City of Tucson, professing to have Competent Person training from a prior employer shall be required to attend Competent Person training offered or facilitated by Central Safety Services.

6.0 GENERAL

A. Competent Person

1. On every job site where an excavation is present or planned, there shall be a Competent Person present at all times when employees are working in the excavation or trench. The Competent Person shall have responsibility for:

   Soil Conditions
   The Competent Person shall have the responsibility of classifying soil conditions as per OSHA Standard and shall reference Section 6, Paragraph H of this procedure and document the soil conditions for the record. The Competent Person shall select the appropriate method of benching or sloping or shall select or cause a Contract Vendor to select a shoring method to protect the employee(s).

   Inspections
   Inspections are required when employees can be reasonably anticipated to work within the excavation.

   A. Daily inspections of excavations, the adjacent areas and the shoring shall be made by a competent person for:

      - Evidence of a situation that could result in a possible cave-in.
      - Indications of shoring failure.
      - Hazardous atmospheres.
      - Other hazardous conditions.

   B. An inspection shall be conducted by a competent person:

      - Prior to the start of work.
      - As needed throughout the shift.
      - After every rain event.
      - After any hazard-increasing occurrence.

   Where a competent person finds evidence of a hazardous condition, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure employee safety.

B. Hazardous Atmospheres

1. To prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions prior to entry, the Competent Person shall evaluate the following:

   a. Where oxygen deficiency (atmospheres containing less than 19.5% oxygen) or a hazardous atmosphere exists or could reasonably be

expected to exist, such as excavations in landfill areas or areas where hazardous substances are stored nearby, the atmosphere in the excavation shall be tested before employees enter excavations greater than four (4) feet in depth.

b. Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5% oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation.
c. Adequate precaution shall be taken, such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10% of the lower flammable limit of the gas.
d. Adequate precautions shall be taken in excavations to protect personnel from the hazards of unsafe accumulations of vapor or gas.
e. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

C. Emergency Rescue Equipment

1. Emergency rescue equipment, in the form of a safety harness and life line, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use. Note: Employees shall not enter IDLH atmospheres or potential IDLH atmospheres unless trained and fitted with air-supplied equipment under specific and monitored conditions.

2. Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials and shall be individually attended at all times while the employees wearing the lifeline are in the excavation.

D. Surface encumbrances

1. All surface encumbrances shall be evaluated prior to excavation and supported so as not to create an additional hazard. Excavating under surface encumbrances (sidewalks, supporting walls, etc.) is not permissible without evaluation from a Registered Professional Engineer.

E. Underground installations

1. The estimated location of utility installations, such as sewer, telephone, fuel, 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.

a. Arizona Blue Stake shall be contacted and advised of proposed work and asked to establish the location of underground installations prior to the start of the actual excavation.
b. When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means, such as excavation by hand digging.
c. While the excavation is open, underground installations shall be protected, supported or removed as necessary to protect employees.

F. Egress

1. A ladder or other safe means of egress shall be located as to require no more than twenty-five (25) feet of lateral travel in any direction for employees in excavations that are four (4) feet or more in depth in trench excavations.

2. The ladder shall be:
   a. Installed within any shoring device or box;
   b. Footed correctly and secured;
   c. Shall extend three (3) feet above ground level.

G. Vehicular Traffic

1. Employees exposed to vehicular traffic shall be provided with, and shall wear ANSI Type II Safety Vests.

H. Soil Conditions

1. Soil is observed as it is excavated. Soil conditions are to be qualified by the Competent Person through recognized testing procedures as defined in the OSHA Standard.

   a. Type A Soil: Unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Typically classified as solid rock or near solid rock composition. Type A soils are uncommon in the Tucson Valley.
   b. Type B Soil: Unconfined compressive strength of 0.5 tsf to 1.5 tsf – typically layered soils of clay, silt, clay, caliché and hardpan. Type B soils are fairly common in undeveloped or undisturbed areas of the Tucson Valley.
   c. Type C Soil: Unconfined strength less than 0.5 tsf – typically gravel, sand, sandy loam, wet or submerged soil. Soil that has been **previously disturbed by any excavation or construction type activity should be qualified as Type C, regardless of compaction methods.** Type C soils are very common in developed areas of the City and Pima County.

2. Excavations or trenches measuring 20’ or less in depth, in Type A or B soil shall be sloped or, benched per OSHA standard, which may include

protective systems. In the absence of bench or sloping protective systems or Aluminum Hydraulic Shoring shall be installed per OSHA Standard.

3. Excavations in Type C soil measuring 20' or less shall be sloped at a grade of 1.5/1 or a combination of slope and shield as per OSHA Standard.

4. Aluminum Hydraulic Shoring in Type C soil shall be accompanied by a horizontal waler system. Walers shall be plywood type in good condition, measuring 1.25" thick, 14 ply, Finland Form. Hydraulic Shoring and walers utilized in Type C Soil shall be installed as per OSHA Standard.

I. Spoils

Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least two (2) feet from the edge of the excavation, by the use of retaining devices that are sufficient to prevent materials or equipment from falling into excavations, or by a combination of both, if necessary.

J. Stability of adjacent structures

1. Excavations **shall not** be permitted under the following circumstances:

   a. Where the stability of adjoining buildings, walls or other structures is endangered by excavation operations;
   b. Where any excavation below the level of the base or footing of any foundation or retaining wall could be reasonably expected to pose a hazard to employees;
   c. Where the sidewalks or pavements, and any attached structures would be undermined.

K. Fall Protection

1. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided when the trench or excavation depth is six (6) feet or greater.

L. Water Accumulation – Excavation and Trenches

1. Employees shall not work in excavations in which there is accumulated water, or in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.

2. If water is controlled or prevented from accumulating by the use of water removal equipment, the equipment shall be monitored by a Competent Person to ensure proper operation.

3. If excavation work interrupts the natural drainage of surface water, suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a Competent Person.

4. Water intrusion or water accumulation shall cause any soil condition to be classified by the Competent Person as a Class C soil and shall be cause for the Competent Person to evaluate the trench or excavation, *regardless of depth*, for the installation of a Aluminum Hydraulic shoring and sheeting system where employees are exposed to the dangers of trench or excavation collapse.

M. <u>Exposure to Falling Loads</u>

1. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator. Employees shall not be transported by the bucket of a backhoe into or out of a trench or excavation.

N. Warning system for mobile equipment

1. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized. The warning systems shall consist of barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

O. <u>Shoring Systems</u>

1. Materials used for shoring systems shall be free from damage or defects that might impair their proper function.

   <u>Installation and removal</u>

   a. Members of shoring systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

   b. Shoring systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by parts of the shoring system.

   c. Individual members of shoring systems shall not be subjected to loads exceeding those which they were designed to withstand.

d. 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 shoring system.

e. 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.

f. Back filling shall progress together with the removal of shoring systems from excavations.

g. Employees *shall* work within the trench box or shoring system at all times. Employees ***shall not*** be in the trench box when the box is being repositioned.

P. <u>Timber Shoring for Excavations</u>

1. Timber Shoring for excavations, if/when utilized within the City of Tucson shall be designed and installed as per OSHA Appendix C to Subpart P. **Other timber shoring configurations must be designed by a registered professional engineer.**

Q. Other Protective Systems

1. Other design shall be in written form, and a copy of the design shall be maintained at the job site.

A. <u>Manufacturer's tabulated data</u>
Shall include specifications, recommendations, limitations and manufacturer's approval to deviate when permitted.

B. <u>Other tabulated data</u>
Shall include **ALL** of the following:

- Identification of the parameters which affect the selection of a protective system drawn from such data.
- Identification of the limits of use of the data.
- Information for the correct selection of a protective system from the data.
- Identification of the registered professional engineer who approved the data.

C. <u>Registered Professional Engineer's Design</u>

The design shall include a plan, indicating the sizes, types and configurations of the materials to be used, and shall identify the registered professional engineer who approved the design.

7.0 ADVICE AND COUNSEL

Central Safety Services shall provide advice and counsel on this procedure by referencing OSHA 29CFR 1926.650 Subpart P – Excavations

Appendix A
EXCAVATION CHECKLIST

Department		**Date**	
Project Name		**Approx. Temp.**	
Project Location		**Wind Dir.**	
Job Number		**Safety Person**	
Excavation Depth & Width		**Soil Classification**	
Protective System Used			
Activities In Excavation			
Competent Person			

Excavation > 5 feet deep? ___Yes ___No
NOTE: Trenches over 5 feet in depth require that employees are protected from collapse or cave-in by approved method (sloping/benching/shoring or box)

YES	NO	N/A	DESCRIPTION
GENERAL			
			Employees protected from cave-ins & loose rock/soil that could roll into the excavation
			Spoils, materials & equipment set back at least 2 feet from the edge of the excavation.
			Engineering designs for sheeting &/or manufacturer's data on trench box capabilities on site
			Adequate signs posted and barricades provided
			Training conducted w/ employees prior to entering excavation
UTILITIES			
			Blue Stake contacted and approval to excavate is authorized
			Overhead lines located, noted and reviewed with the operator
			Utility locations reviewed with the operator, & precautions taken to ensure contact does not occur
			Utilities crossing the excavation supported, and protected from falling materials

			Underground installations protected, supported or removed
WET CONDITIONS			
			Precautions taken to protect employees from water accumulation (continuous dewatering) and shoring
			Surface water or runoff diverted /controlled to prevent accumulation in the excavation
			Inspection made after every rain event, water leak or other hazard increasing occurrence
HAZARDOUS ATMOSPHERES			
			Air in the excavation tested for oxygen deficiency, combustibles, other contaminants
			Ventilation used in atmospheres that are oxygen rich/deficient &/or contains hazardous substances
			Ventilation provided to keep LEL below 10 %
			Emergency equipment available where hazardous atmospheres could or do exist
			Safety harness and lifeline used
			Is Supplied air necessary
ENTRY & EXIT			
			Exit (i.e. ladder, sloped wall) no further than 25 feet from ANY employee
			Ladders secured and extend 3 feet above the edge of the trench
			Ramps constructed of uniform material thickness, cleated together @ the bottom
			Employees protected from cave-ins when entering or exiting the excavation

KEEP 1 COPY OF EACH DAILY EXCAVATION CHECKLIST ON SITE FOR THE PROJECT DURATION, AND FILE THE ORIGINAL WITH REPAIR OR CONSTRUCTION DOCUMENTS