

**TO: ALL COUNTY PERSONNEL**

**FROM: VERDENIA C. BAKER  
COUNTY ADMINISTRATOR**

**PREPARED BY: RISK MANAGEMENT, LOSS CONTROL**

**SUBJECT: TRENCHING AND SHORING PROCEDURES**

**PPM#: CW-O-069**

---

---

**ISSUE DATE**  
**July 5, 2023**

---

---

**EFFECTIVE DATE**  
**July 5, 2023**

---

---

**PURPOSE:**

To minimize the risk to County Employees and Property by defining an appropriate method of trenching and shoring operations on County projects.

**UPDATES:**

Future updates to this PPM is the responsibility and the direction of the Director of Risk Management.

**AUTHORITY:**

- OSHA 29 CFR 1926 Subpart P-Excavations, 1926.650-653 for Trenching and Shoring, as may be amended.
- OSHA 29 CFR 1910.146 Permit Required Confined Spaces, as may be amended.
- CW-P-037 – Safety Footwear

**DEFINITIONS:**

See Attachment A

**POLICY:**

Excavations of five (5) feet or more in depth must employ a protective system unless determined unnecessary by tabulated data of a Florida Registered Professional Engineer. Excavations of less than five (5) feet in depth may not require a protective system if the results of an examination by a competent person determine that there is no potential for a cave-in.

## **RESPONSIBILITIES:**

### **A. Department/Division Heads:**

Each Department/Division Head is responsible for ensuring the implementation of this policy in their divisions and operations under their control.

### **B. Supervisors:**

1. Supervisors shall train all Employees involved in Trenching and Shoring Operations on this PPM and shall ensure that this PPM is followed.
2. Supervisors who are involved must be knowledgeable and experienced in Trenching and Shoring Operations and receive a competent /certified person status.
3. Supervisors should reinforce the importance of safety, to include best practices and high-hazard situations, prior to the execution of any Trenching and Shoring operations with all on-site workers.
4. Supervisor must confirm that a Competent Person is on location at all times during trenching and shoring activities.

### **C. Employees:**

1. Must comply with the operating procedures included in this PPM.
2. Must attend initial training in trenching and shoring operations prior to working on a Trenching and Shoring job and refresher training every (2) years.
3. Be aware of the hazards associated with any hazardous atmosphere conditions and prevent exposure through engineering controls and/or Personal Protective Equipment (PPE).
4. Wear the appropriate PPE as indicated per the Trenching and Shoring operation project.
5. Be on the lookout for potential failures of a protection system.

### **D. Employee Safety/Loss Control (ES/LC) shall:**

1. Coordinate all Trenching and Shoring training and safety meetings to reinforce safety procedures for all supervisors and employees.
2. Identify the Competent person in each department responsible for Trenching and Shoring policy to confirm compliance with this PPM.

## **PROCEDURES:**

### **A. Training:**

ES/LC shall provide all Trenching and Shoring training as required. Initial training for affected employees shall take place prior to working on any trenching job. Employees shall receive trench safety awareness training at least every two years thereafter.

Training shall include:

1. Basic understanding of Trenching and Shoring systems.
2. Awareness of Trenching dangers.
3. Personal protective equipment.
4. Basic understanding of testing procedures needed and the operation of atmospheric monitoring equipment.
5. Familiarity with the selection and use of Trenching/Shoring equipment.
6. Emergency procedures.

### **B. Underground Installations:**

The estimated location of utility installations, such as sewer, telephone, fuel, electric, cable, water, or any other underground installations that reasonably may be expected to be encountered during excavation work, will be determined prior to opening an excavation.

### **C. Checklists and Reports:**

The following checklists and reports shall be completed prior to and during a Trenching operation. The forms are located on the County Intranet site under Countywide Forms and on the Risk Management website page under Forms. The forms listed below shall be completed by the project supervisor and/or Competent Person in the following order:

1. **Design Checklist** - This report is used to assist in design considerations prior to excavating.
2. **Construction Checklist** - This report is completed during excavation to document operational procedures.
3. **Trench Safety Daily Field Report** - This report is repeated daily during a trenching operation.

### **D. Records:**

1. Records of Design, Construction, and Trench Safety Reports shall be maintained in the department files.

2. ES/LC shall maintain all Employee training records through TED or an LMS system.

**E. Protective Systems:**

1. Protective systems are required in any trench that is five (5) feet in depth or greater, made in any soil other than stable rock.

**Note: Stable rock is not native to Palm Beach County.**

2. Protective systems shall have the capacity to withstand all loads that are intended or could be expected to be applied or transmitted to the system Examples are:

Shoring  
Shoring with Shielding  
Sloping  
Sloping with benching  
Stable rock

3. All projects of this nature must be approved by a Florida Registered Professional Engineer, following all OSHA Standards associated with 29 CFR 1926.650-652.

**F. Access & Egress:**

1. Means of access and egress from trench excavations must be provided. A stairway, ladder, ramp, or other safe means of access and egress must be located in trench excavations that are five (5) feet or more in-depth to require no more than (25) feet of lateral travel for employees.
2. Structural ramps that are used solely by employees as a means of access or egress from excavation shall be designed by the project supervisor to ensure all safety protocols are being adhered to.

**G. Testing:**

A Competent Person will conduct visual and manual soil testing during all Trenching and Shoring operations prior to anyone entering an excavation.

1. **Hazardous Atmospheres/Testing:** All excavations where there is a potential for an oxygen deficiency or hazardous atmosphere to exist (excavations near a landfill or where hazardous materials are stored) and are deeper than four **(4) feet** shall be tested before entering. This testing is to ensure safe atmospheric conditions are present. At a minimum, the atmosphere shall be tested for the following:

- a. Any flammable gas, vapor, or mist in excess of 10 % of its lower flammable limit (LFL); in cases where the flammable gas is unknown, use an excess of 10% of the gas monitor calibration gas. Most alarms are set at 10% (e.g., hexane).
- b. An airborne combustible dust at a concentration that obscures vision at a distance of five (5) feet or less.
- c. An oxygen concentration below 19.5% or above 23.5%.
- d. An atmospheric concentration of any substance for which a permissible exposure limit is published in 29 CFR 1926.650 Subpart Z or on the applicable Safety Data Sheet, which could result in employee exposure in excess of its permissible limit(s).
- e. Any atmospheric condition recognized as immediately dangerous to life or health.

2. **Visual Soil Test:**

- a. Observe the soil and take samples as it is excavated.
  - Soil that remains in clumps is cohesive.
  - Soil that breaks up easily and does not stay in clumps is granular.
- b. Observe the side of the excavation, crack-like openings such as tension cracks could indicate fissured material.
- c. Check the area adjacent to the excavation and the excavation itself for disturbed soil and other underground structures.
- d. Check for vibration that might affect the stability of the excavation.

3. **Manual Soil Test:**

- a. Spread a 1/8" or 1/4" thick sample of wet soil on the palm of the hand. Wipe the surface of the sample with a finger to remove visible water. With the palm facing up, slap the back of the hand moderately 5 to 10 times. If water rises to the surface of the sample, then the soil is mostly cohesion, indicating less silt or sand. If no water appears, the soil is mostly a cohesive clay.
- b. The thumb penetration test can be used to estimate the unconfined

compressive strength of cohesive soils. Take a large clump of soil as soon as excavated. Try to indent the soil with the thumb. Type "A" will be extremely hard to indent. This means type "A" soil has a minimum unconfined compressive strength. Type "C" may indent up to several inches; this means type "C" has a maximum unconfined compressive strength.

#### **H. Other Procedures:**

1. Under no circumstance shall an employee work alone. The buddy system shall always be utilized.
2. While the excavation is open, the project supervisor in charge is responsible for safeguarding employees at all times.
3. Underground installations shall be protected, supported, or removed as necessary for safety in an open excavation.
4. Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating (e.g., well points, pumps), unless precautions have been taken to protect employees by means of engineering controls.
5. If excavation work interrupts the natural drainage of surface water such as streams, diversion ditches, or dikes, then surface water must be prevented from entering the excavation. Adequate drainage of the area adjacent to the excavation must be provided.
6. Walkways or bridges with standard guardrails and toe boards will be provided where employees or equipment are required or permitted to cross over an excavation.
7. Employees must be protected from excavated materials or equipment that could pose a hazard by falling or rolling into excavations.
8. The estimated location of underground utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations shall be determined prior to opening an excavation.

#### **I. Inspections:**

1. Daily inspections of excavations, adjacent areas, and protective systems shall be made by the project supervisor.
2. Prior to any excavation, all surface encumbrances that are located in areas that create potential hazards to employees shall be removed or supported.

3. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence.
4. Inspection of adjacent structures shall be made where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations. Support systems such as shoring, bracing, or underpinning shall be provided as determined by a Florida Registered Professional Engineer.
5. The project supervisor shall complete a Trench Safety Daily Field Report. Access this form on the County Intranet under Countywide Forms or on the Risk Management web page under FORMS.

**J. Personal Protective Equipment:**

1. All lifelines, harnesses, and any other equipment needed for entry or exit shall be inspected by a competent person for defects before entry.
2. Employees engaged in Hand Digging must wear approved hard hats when working in or around excavations.
3. Eye and face protection shall be worn whenever employees are exposed to flying objects or glare. Chemical goggles are to be provided whenever employees are exposed to sewage, chemicals, vapors, or dust.
4. Appropriate Safety Footwear must be worn at all times, to protect employees from the potential hazards present at the job site. Refer to CW-P-037, Safety Footwear, for additional guidance.
5. Full body protection and proper respiratory protection shall be worn whenever in direct contact with chemicals, sewage, and/or hazardous atmospheres
6. Hearing protection shall be worn whenever the noise exposure to employees exceed a time-weighted average of 85 dBA or an instantaneous noise level of 140 dBA. If in doubt as to a noise source or exposure levels, contact ES/LC.
7. Contact ES/LC immediately if work activities generate a hazardous atmosphere or environmental conditions exceeding permissible limits.

**K. Outside Personnel:**

1. Whenever outside personnel are engaged in Trenching and Shoring activities on County projects, they must abide by the guidelines outlined in OSHA 29

CFR 1910.146 and 29 CFR 1926.650-653.

2. All bid documents for contracted services involving Trenching and Shoring operations shall contain verbiage that requires outside contractors to abide by the procedures outlined in OSHA 29 CFR 1910.146 and 29 CFR 1926.650-653.

**L. Trenching Machines**

The following rules apply equally to all mechanical devices used to dig trenches and/or make excavations including various types of trenches, backhoes, buckets, scoops, and similar pieces of equipment.

1. Operators should always wear hard hats.
2. Never attempt to oil or grease a mechanism or repair or adjust any moving part of a trenching machine while it is in operation. Only qualified personnel shall operate a trenching machine.
3. When practicable, drop dirt between the excavation and the highway to act as a barrier.
4. Use flags by day and flashing lights or flares by night to warn the public of the trenching machine and its operations. Use these precautions on all highway or street work. Always plan the warning system before the work is started.
5. Operate the machine vertically to prevent undercutting the trench walls.
6. When loading or unloading trenching machines or other heavy equipment from truck beds, lowboys, or other conveyances provide suitable skids and ample blocking to prevent movement of the conveyance.

**M. Emergency Procedures:**


The following are emergency procedures for actions to be taken should an emergency arise (e.g., an entrant becomes incapacitated in the trench for whatever reason). The procedures are designed to get the entrant(s) out as quickly as possible without jeopardizing anyone attempting a rescue. If an entrant becomes incapacitated, the following steps must be taken to facilitate a safe rescue:

1. Urgent Emergency



- a. Immediately dial 911, and contact Emergency Operations Center (E.O.C.) Both organizations will need the following information:
  - b. State the nature of the request (need Fire Rescue, police, etc.),
  - c. State your name, location and give directions if necessary, and
2. If emergency services are required, appoint someone to relocate to a location that is highly visible and clear from any hazards. Guide arriving emergency vehicles to your location (e.g., waving your hands and shouting).
3. Contact the Emergency Operations Center (E.O.C.) by any means necessary at 561) 712-6428.

Once notification has been established to all appropriate parties, the attendant may attempt to pull the incapacitated entrant out of the trench via the lifeline. **Under no circumstances shall the attendant enter the trench.**

  
**VERDENIA C. BAKER**  
**COUNTY ADMINISTRATOR**

Supersession History

PPM # CW-O-069, effective 10/26/1999

PPM # CW-O-069, effective 5/11/2011

PPM # CW-O-069, effective 7/15/2016

## **ATTACHMENT A: DEFINITIONS**

**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 or steps, usually with vertical or near-vertical surfaces between levels.

**Cave-in** means the separation of a mass of soil or rock material from the side of an excavation either by falling or sliding, in a sufficient quantity that could entrap, engulf, or otherwise injure/immobilize a person.

**Competent Person** means someone who has successfully completed a course in trenching and shoring operations, who is capable of identifying existing and predictable hazards in the surroundings and who has authorization to take prompt corrective measures to eliminate them.

**dBA** means the noise level is measured in decibels (db). The louder the noise the higher the decibels. Noise level is thus described in decibels. dBA levels are "A" weighted according to the weighting curves to approximate way the human ear hears.

**Excavation** means any manufactured cut, cavity, trench, or depression in the Earth's surface, formed by earth removal.

**Failure** means breakage, displacement, or permanent deformation of a structural member or connection to reduce its structural integrity and its supportive capabilities.

**Hazardous Atmosphere** means an atmosphere which exposes employees to a risk of death, incapacitation, or illness. Such atmospheres may be considered explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient or toxic.

**Project Supervisor** is the onsite "competent person" in charge of the trenching and shoring project.

**Protective System** means a method of protecting employees from cave-in. Examples of protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

**Ramp** is an inclined walking or working surface that is used to gain access from one point to another.

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

**Sheeting** means the components of a shoring system that retain the earth in

position and in turn are supported by other members of the shoring system.

**Shield** means a structure that is able to withstand the forces imposed on it by a Cave-in. Also, referred to as a trench box.

**Shoring** means a metal hydraulic, mechanical, or timber structure which supports the sides of an excavation.

**Sloping** means a method of inclining the sides of an excavation 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.

### **Soil Types**

**Type A** - Examples are clay, silty clay, sandy clay, clay loam, and in some cases silty clay loam and sandy clay loam. It cannot be type "A" if the soil is fissured, is subject to vibration from heavy traffic, pile driving, or similar effects, or the soil has been previously disturbed, or is part of a sloped, layered system.

**Type B** - Examples are angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and in some cases, silty clay loam and sandy clay loam, or any previously disturbed soil.

**Type C** - Examples are granular soils including gravel, sand and loamy sand; or submerged soil or soil from which water is freely seeping; or submerged rock that is not stable, solid coral rock. (Most common type of soil in Palm Beach County)

**Stable Rock** is a natural solid mineral material that can be excavated with vertical sides and will remain intact.

**Tabulated Data** means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

**Trench** is a narrow excavation made below the surface of the ground with a width not greater than 15 feet.

**Unconfined Compressive Strength** means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

**Uprights** are the vertical members of a trenching system.

**Wales** are horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.