**Non-Typical Excavation**

**EXCAVATION SAFETY POLICY**

**PURPOSE:**

The purpose of this policy is to prevent personal injury and illness to Non-Typical Excavation employees while performing excavation duties.

**OBJECTIVES:**

The objectives of this policy are to establish a written program outlining general guidelines governing

excavations and trenches.

This written program will address the following:

1. Definitions

2. Hazards

3. Pre-Planning

4. Soil Classification

5. Testing of Soil

6. Protective Support Systems

7. Backfilling

8. Excavating Near Utilities

9. Emergencies, Rescue Policy

**RESPONSIBILITY:**

**Department Heads Have the Responsibility to:**

I. Implement this excavation policy by:

A. Directing all supervisors to assess the hazards of each excavation and to identify the employees this

may affect.

B. Providing all employees with information, training, and the equipment they need to protect

themselves and others from excavation hazards.

C. Ensuring that all necessary equipment is available to comply with this policy.

II. Enforce compliance with this policy. All appropriate employees, presently employed and all new

employees, must be trained and responsible for the purpose and the use of this excavation safety

policy.

**Supervisors Have the Responsibility to:**

I. Identify and assess the hazards of each excavation area.

II. Ensure that all employees receive the appropriate training and equipment they need to protect

themselves and others.

III. Enforce compliance with this policy.

**Employees Have the Responsibility to:**

I. Understand their assigned tasks relating to excavation safety.

II. Apply the proper training and equipment to safely work in excavations and trenches.

III. Assist with the assessment and the identification of excavation hazards.

IV. Comply with the directives of this policy.

**1. Definitions**

An **excavation** is any man-made cut, cavity, trench, or depression in the earth’s surface formed by

earth removal. Excavations produce unsupported soil conditions.

A **trench** is a narrow excavation made below the surface of the ground in which the depth is greater

than the width. The width does not exceed 15 feet.

A **sloping system** 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

A **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 nearvertical

surfaces between levels.

**Aluminum Hydraulic Shoring** means a pre-engineered shoring system comprised of aluminum

hydraulic cylinders (cross braces) used in conjunction with vertical rails (uprights) or horizontal rails

(wales). Such system is designed specifically to support the sidewalls of an excavation and prevent

cave-ins.

**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.

**Competent person** means someone 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.

**Distress** means that the soil is in a condition where a cave-in is imminent or is likely to occur. It is

evidenced by such phenomena as the development of fissures in the face of or adjacent to an open

excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the

bulging or heaving of material from the bottom of an excavation; the spalling of material from the face

of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of

material suddenly separating from the face of an excavation and trickling or rolling down into the

excavation.

**Faces or sides** means the vertical or inclined earth surfaces formed as a result of excavation work.

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.

**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.

**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” withing the meaning of this standard when

approving designs for “manufactured protective systems” or “tabulated data” to be used in interstate

commerce.

**2. Hazards**

The most common hazards that should be recognized and associated with work in excavations can

categorized as follows:

A. **Cave-ins** -- Cave-ins are the most common excavation hazard. They occur when a mass

of soil or rock material separates from the side of an excavation or when soil is lost from

under a trench shield or support system. The mass of soil or rock material then moves

suddenly into the excavation either by falling or sliding. Cave-ins can entrap, bury, or

otherwise injure and immobilize a worker. Protective Support Systems such as sloping,

benching, shielding, and shoring should be used to protect workers from cave-ins.

B. **Falls** -- Use warning systems such as mobile equipment, barricades, hand or mechanical

signals, or stop logs to alert operators of the edge of an excavation. Don’t let employees

work on faces of sloped or benched excavations at levels above other employees unless

the employees at lower levels are adequately protected.

C. **Equipment Accidents** -- Keep all equipment that might fall into an excavation at least 2

feet from the edge of the excavation. Also, keep excavated soil at least 2 feet from the

edge of the excavation.

D. **Water Accumulation** -- Employees are not to work in excavation areas where water has

accumulated unless water removal equipment is being used. Diversion ditches, dikes, or

other means should be used to prevent surface water from entering an excavation and to

provide drainage.

E. **Hazardous Atmospheres** -- Any excavation deeper than four feet or where an oxygen

deficiency or a hazardous atmosphere exists or could exist needs to be checked by a

competent person. If hazardous conditions exist, respirators must be worn or ventilation

must be provided and the atmosphere need to be monitored.

F. **Access and Egress** -- **If an excavation is deeper than four feet**, adequate means of exit,

such as ladders, steps, ramps or other safe means of egress must be provided and be

within 25 feet of the worker. They must extend three feet above the ground.

**3. Pre-planning:**

A. An excavation Competent person shall be on site at each excavation

B. Before beginning any excavation, identify and evaluate specific job hazards. These can

include traffic, nearness of structures and their conditions, soil, surface and ground water,

the water table, overhead and underground utilities, and weather.

C. Call the Digger’s hotline 48 hours before digging (1-800-331-5666) for the exact location of

all utilities including: electric, gas, telephone, sewer, water, and cable television lines.

D. Pick the correct type of personal protective equipment for the job. If you are to be working

near vehicular traffic, wear a warning vest or other suitable garments marked with or made

of reflectorized or high-visibility material. Also wear hard hats, goggles, adequate foot wear,

and respirators as necessary.

**4. Soil Classification:**

Every soil and rock deposit needs to be classified by a competent person as stable rock, type A, type B, or

type C before excavation can begin. In a layered system, the system is classified according to its weakest

layer. Any time the properties, factors, or conditions affecting the soil type change in any way, the area

needs to be reevaluated and reclassified to reflect the changed circumstances.

1**. Stable rock** is natural solid mineral matter.

2. **Type A soil** is cohesive soil with an unconfined, compressive strength of 1.5 tons per square foot or

greater. Examples of Type A soils are: clay, silty clay, sandy clay, clay loam, caliche, hardpan and,

in some cases, silty loam and sandy clay loam. No soil is Type A if:

a. The soil is fissured.

b. The soil is subject to vibration from heavy traffic, pile driving, or similar effects.

c. The soil has been previously disturbed.

d. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of

four horizontal to one vertical or greater.

e. The material is subject to other factors that would require it to be classified as a less stable

material.

3. **Type B soil** is:

a. Cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot, but

less than 1.5 tons per square foot.

b. Granular cohesionless soil including: angular gravel, silt, silt loam, sandy loam and, in some cases,

silty clay loam and sandy clay loam.

c. Previously disturbed soil except that which would otherwise be classed as Type C soil.

d. Soil that meets the unconfined compressible strength or cementation requirements for Type A, but

is fissured or subject to vibration.

e. Dry rock that is not stable.

f. Material that is part of a sloped, layered system where the layers dip into the excavation on a slope

less steep that four horizontal to one vertical, but only if the material would otherwise be classified

as Type B.

4. **Type C** soil is:

a. Cohesive soil with an unconfined compressive strength of 0.5 tons per square foot or less.

b. Granular soil including gravel sand and loamy sand.

c. Submerged soil or soil from which water is freely seeping.

d. Submerged rock that is not stable.

e. Material in a sloped, layered system where the layers dip into the excavation or a slope of four

horizontal to one vertical or steeper.

**5. Testing of Soil:**

Classification tests of soil shall be performed by a competent person using at least one visual test and one

manual test.

A. Visual tests provide qualitative information on the excavation site in general, the soil adjacent to the

excavation, the soil forming the sides of the open excavation, and the soil taken as samples from the

excavated material. To perform a visual test:

 1. Observe samples of soil and estimate the range of particle sizes and their relative

 amounts. Soil that is primarily composed of fine-grained material is cohesive material.

 Soil composed primarily of coarse-grained sand or gravel is granular material.

 2. Observe soil as it is excavated. Soil that remains in clumps is cohesive and soil that

 breaks up easily is granular.

 3. Observe the side of the opened excavation and the adjacent surface. Crack-like

 openings, tension cracks, and chunks of soil that spall off a vertical side could indicate

 fissured material. Small spalls are evidence of moving ground and are potentially

 hazardous.

 4. Observe the surrounding area and the excavation area itself for existing utility and

 other underground structures, and to identify previously disturbed soil.

 5. Observe the sides of the excavation for layered systems.

 6. Observe the excavation area for evidence of surface water, water seeping from the

 sides of the excavation, or the level of the water table.

 7. Observe the excavation area for sources of vibration that may affect the stability of the

 excavation face.

B. Manual tests provide quantitative as well as qualitative properties of soil. They provide more

information in order to classify the soil properly. Some examples of manual tests include:

1. Plasticity

2. Dry strength

3. Thumb penetration

4. Other strength tests: pocket penetrometer, hand-operated shearvane

5. Drying test

**6. Protective Support Systems:**

The excavation competent person shall determine the type of protection

**Protective support systems are required to protect Non-Typical employees from cave-ins while**

**working in any excavation unless:**

1. The excavation is made entirely in stable rock, or

2. The excavation is less than 5 feet deep and a competent person has examined the ground and found

no indication of a potential cave-in. When soil conditions are unstable, excavations less than 5 feet

deep must also be protected from cave-ins.

Protective systems shall have the capacity to resist without failure all loads that are intended or could

reasonably be expected to be applied or transmitted to the system.

A. Sloping and Benching Systems

1. A sloping system 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.

2. 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. Use charts and

tables to determine the angle of incline.

3. The maximum allowable slope means the steepest incline of an excavation face that is acceptable

for the most favorable site conditions as protection against cave-ins, and is expresses as the ration

of horizontal distance to vertical rise (H:V). This varies according to the soil type which can be

classified by a competent person. See Table 2 for the maximum allowable slopes.

4. The actual slope shall never be steeper than the maximum allowable slope. When there are signs

of distress, the slope shall be cut back to an actual slope which is at least ½ horizontal to one

vertical (1/2H:1V) less steep than the maximum allowable slope.

5. A 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 nearvertical

surfaces between levels.

6. The length of the vertical sides of a benching system and the maximum allowable slope 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. Use charts and tables to determine the length of

the sides and the maximum allowable slope.

7. It is always better to over-compensate and make the angle flatter.

B. Shielding Systems

1. A shield system means a pre-constructed structure that is able to withstand the forces imposed on it

by a cave-in and thereby protect employees withing the structure. Shields used in trenches are

usually referred to as trench boxes or trench shields.

2. Shields can be permanent structures or can be designed to be portable and moved along as work

progresses.

3. Shielding must extend above the ground level or the trench walls above the top of the box must be

sloped.

C. Shoring Systems

1. A shoring system 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.

2. Shoring systems shall be installed from the top down and removed from the bottom up. Unless

they are installed and removed from outside the trench.

**7. Backfilling:**

Use machines to fill the excavated area as soon as you are done working in that area. Backfill materials

shall not be pushed or dumped into an excavation while an employee is still in it. At the completion of a

backfill operation, excess fill and other debris should be completely cleaned up, especially on paved roads.

**8. Excavating Near Utilities:**

When excavating near utility lines, always follow all excavation safety rules, as well as, these special

situation rules.

A. If you are digging within eighteen inches of a utility line, ask the utility company to expose and protect

the line.

B. A Material Safety Data Sheet (MSDS) should be obtained for all chemicals that may be contained in

pipelines and vessels. The warnings on the MSDS should be followed.

C. Mechanical digging is not allowed near the utility lines.

D. Power tools and mechanical equipment such as concrete breakers, drills, and backhoes should be

effectively grounded with a 2/0 ground lead.

E. Be careful not to drop large rocks, roots, or clumps of soil directly on to the exposed utility line while

backfilling.

F. When utilities are exposed in a trench and are unsupported, supports shall be installed as needed to

prevent damage or creating a hazardous situation.

**9. Emergencies:**

If you are about to be buried in a cave-in:

1. Yell to get attention.

2. Cover your face with your arms.

3. Do not struggle to free yourself, just wait calmly for rescue.

If you are watching someone be buried in a cave-in:

1. Do not attempt to rescue them yourself. Never enter the excavation.

2. Notify the Fire Department by calling 911 on your radio or phone. Give the emergency

personal information about the exact location of the accident, the number of victims

involved, the trench measurements, and special hazard information.

3. Shut down all heavy equipment and move other workers away from the area.

4. Monitor the situation until LFD rescue personnel arrive.