

DuPage County Environmental, Safety, Health & Property Loss Control Program

Excavation & Trenching Confined Space Procedure



1.0 Purpose:

The purpose of this program is to establish guidelines to be followed to control excavation activities. All excavations will be done in full compliance of OSHA 29 CFR 1926.650, Subpart P.

Definitions:

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

Qualified person means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated their ability to solve or resolve problems relating to the subject matter, the work or project.

2.0 Policy:

- An Excavation Competent Person must be on the job site and outside of the excavation inspecting and monitoring the excavation, whenever there are excavation operations in progress or whenever personnel must enter into an existing excavation.
- Inspections are to look for fissures or cracks on the excavation surface, slumping of material from the excavation face, bulging or heaving at material from the excavation space, small amounts of material trickling into the excavation. Consider vibrating machinery or heavy, moving loads.
- Supervisors (including Crew Leaders) shall insure that all affected employees comply with all provisions contained in this Excavation Permit Program.
- No one under the age of 18 may work at an Excavation site.
- No Interns may work in an excavation/trench.
- For Excavations less than 5 feet in depth situated in stable rock or a competent person has determined the ground provides no potential for cave in, such excavations are not required to have a protective cave in system.
- Excavations of 4 feet or more must have a Permit completed by a Supervisor / Crew Leader who has been judged Competent in Excavations and maintained for 1 year.
- Excavations of 4 feet or more must have air in trench tested prior to entry and every 15 minutes while staff is in trench.
- A **Soil Analysis form** must be completed for all excavations of 4 feet or more and maintained for 1 year with Permit.
- Excavations having 5 feet or more in depth must be provided a protective cave in system.
- Call Julie (# 811) to locate all utilities when preplanning work.


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- All excavations must have perimeter protection to warn of the excavation hazard to pedestrians such as Yellow warning tape, snow or cyclone fencing, crossed 2x4's and traffic cones to divert traffic.
- When a Excavation Competent Supervisor / Crew Leader 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 must be removed from the hazardous area until necessary precautions have been taken to ensure their safety.

3.0 Procedures:

3.1 Excavations

No Excavating Will Be Done By Machine Within 2 Feet Of A Utility. Only Hand Digging Will Be Permitted Until Utility Is Visually Verified. 

- 3.1.1 Prior to opening an excavation, copies of available drawings showing existing underground utilities, piping, valves, etc., within and adjacent to the area planned for excavation should be available.
- 3.1.2 An effort must be made to determine whether underground installations; i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located.
- 3.1.3 When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation.
- 3.1.4 Excavation cannot begin until after Julie has marked underground utilities.

3.2 Hand Tool Excavation

- 3.2.1 Where existing underground utilities, etc. are within ten (10) feet from the exposed excavation, supervisor shall visually establish the position of the underground utilities, etc. from the observance of buried utilities surface markers, or in their absence, by hand tool excavation at sufficient intervals.
- 3.2.2 Hand tool excavation for verification may be facilitated by locating cables, piping, etc. with detectors where appropriate.
- 3.2.3 When hand digging to locate electrical utilities, tools with insulated handles should be utilized to minimize the potential for an electrical shock being incurred, should the tool strike a live wire/cable.

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3.3 Cleaning Area

- 3.4.1 Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in excavation work, or in the vicinity thereof at any time during operations, must be removed or made safe before excavating is begun.

3.4 Excavation Area

Every trench and excavation poses an imminent dangerous situation. In order to reduce the hazards associated with trenches, the following procedures have been established for excavation projects.

Note: Foundation excavations may become trenches when the formwork is placed. Once the forms are placed near the excavation walls, that area between the forms and excavation walls may be considered as a trench and so addressed.

3.6.1 General Requirements

- 3.6.1.1 Daily before each shift and after a rain fall inspections of excavations shall be made by a Competent Excavation Supervisor / Crew Leader. The inspections will be documented and maintained on site until project is completed then retained for 1 year at main office.
- 3.6.1.2 Inspections shall be made after a rain or thawing condition as to the stability of the walls or sides of the excavations.
- 3.6.1.3 Employees shall not work in excavations which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against hazards posed by water accumulation. These precautions necessary vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control accumulating water, and or use of a safety harness and lifeline.
- 3.6.1.4 When working in water employees must be provided sufficient boots, waders to keep feet and clothes dry.

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3.6.1.5 If water is controlled or prevented from accumulating by the use of water removal equipment, such shall be monitored by a competent person to ensure proper operation during each shift.

3.6.1.6 If excavation work interrupts the natural drainage of surface water (such as streams) diversion ditches, dikes or other 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,

3.6.2 Specific Requirements

- The walls or faces of the excavation that is deeper than 5 feet must be sloped if shoring is not used.
- Walkways shall be provided when employees are required or permitted to cross over excavations. When walkways **is** 6 feet or more above the lower level then it must be provided handrails, Mid-rails and toe board.

Trenching

3.6.2..1 Banks more than 5 feet high must be shored, laid back to a stable slope, or some other equivalent means of protection must be provided where employees may be exposed to moving ground or cave-ins. Protection is to be determined by a qualified excavation person.


3.6.2..2 Trenches less than 5 feet in depth must also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

3.6.2..3 Sides of trenches in unstable or soft material, 5 feet or more in depth must be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working with them.

3.6.2..4 Sides of trenches in hard or compact soil, including embankments, must be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length.

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3.6.2..5 In lieu of shoring, the side of the trench above the 5 foot level may be sloped to preclude collapse, but must not be steeper than a 1 foot rise to each 1/2 foot horizontal.

- Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, must be in good serviceable condition, and timbers used must be sound and free from large or loose knots, and must be designed and installed so as to be effective to the bottom of the excavation.
- Additional precautions by way of shoring and bracing must be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroads or highway traffic, the operation of machinery, or any other source.
- Employees entering bell-bottom pier holes must be protected by the installation of a removable-type casing of sufficient strength, determined by the project engineer, to resist shifting of the surrounding earth. 

3.6.2..1 Such temporary protection must be provided for the full depth of that part of each pier hold which is above the bell.

3.6.2..2 A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, must be worn by each employee entering the shafts.

3.6.2..3 This lifeline must be individually manned and separate from any line used to remove materials excavated from the bell footing.

- Minimum requirements for **trench timbering** must be in accordance with Appendix 15.

3.6.2.7.1 Braces and diagonal shores in a wood shoring system must not be subjected to compressive stress in excess of values given by the following formula:

$$S = 1300 - (20L/D)$$

Maximum Ratio, $L/D = (50)$

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- When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder, steps or ramps, must be provided and located so as to require no more than 25 feet of lateral travel.
 - Bracing or shoring of trenches must be carried along with the excavation.
- 3.6.2.10 Cross braces or trenching jacks shall be placed in true horizontal positions, be spaced vertically, and be secured to prevent sliding, falling, or kick outs.
- 3.6.2.11 Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping.
- 3.6.2.11.1 Where such trench boxes or shields are used, they shall be designed by a Registered Professional Engineer, constructed, and maintained in a manner that will provide protection equal to or greater than the sheeting or shoring required for the trench.
- 3.6.2.12 Backfilling and removal of trench supports must progress together from the bottom of the trench.
- 3.6.2.13 Jacks or braces must be released slowly and, in unstable soil, ropes must be used to pull out the jacks or braces from above after employee
- 3.6.2.14 The walls and faces of the excavation shall be shored.
- 3.6.2.15 A trench shield shall be used if sloping of the walls is not the preferred method of protecting the employees.
- 3.6.2.16 Vertical cuts are allowed only in solid rock.
- 3.6.2.17 A combination of sloping and trench shield may be used as is directed in the OSHA 29 CFR 1926.650, Subpart P Appendix B and C.
- 3.6.2.17.1 Type A soils - (unconfined compression strength of 1.5 tons per square foot)
- 3.6.2.17.2 Type C soils - (unconfined compression strength of .5 ton per square foot)

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- 3.6.2.18 Another strength test for the estimates of unconfined compression strength of soils can be obtained by the use of a pocket penetrometer.
- 3.6.2.19 Employees shall be provided ladders to exit the trenches or excavations; and they shall be located so that no more than 25 feet of lateral travel is required.
- 3.6.2.20 Excavated materials (spoils) shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.
- 3.6.2.21 Any excavations greater than 20 feet deep shall have the sloping or trenching designed and stamped by a registered professional engineer.
- 3.6.2.22 Employees must be instructed and it is the Supervisor's/Crew Leaders responsibility to assure no employee is ever under a raised load.
- 3.6.2.23 Before and during work within a trench or excavation more than 4 feet deep air sampling must be performed by trained personnel per Confined Space Entry Policy.

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS

A slope or angle of repose that measures 3/4 to 1 is acceptable for Type A soils. Type A soil has an unconfined compression strength of 1.5 ton per square foot or greater. (OSHA 29 CFR 1926.650, Subpart P Appendix B and C.)

Solid rock, Shale or Cemented Sand and Gravel		(90°)
Compacted Angular Gravels 0.5:1		(63°)

A slope or angle of repose that measures 1 to 1 is acceptable for soils classified as Type B. Type B soil has unconfined compression strength greater than 0.5 ton per square foot, but less than 1.5 ton per square foot. (OSHA 29 CFR 1926.650, Subpart P Appendix B and C.)

Recommended for Average Soils	1:1	(45°)
Compacted Sharp Sand	1.5:1	(34°)

A slope or angle of repose that measures 12 to 1 is acceptable for soils classified as Type C. Type C soil has unconfined compression strength of 0.5 ton per square foot or less. (OSHA 29 CFR 1926.650, Subpart P Appendix B and C.)

Well Rounded Loose Sand	2:1	(27°)
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NOTE: Clays, silts, or nonhomogeneous solids require shoring and bracing. The presence of ground water can require special protection to be determined and authorized by a **Registered Professional Engineer.**

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COUNTY of DUPAGE

SOILS ANALYSIS CHECKLIST

This checklist must be completed when soil analysis is made to determine the soil type(s) present in the excavation. A separate analysis must be performed on each layer of soil in the excavation walls. A separate analysis must also be performed if the excavation (trench) is stretched over a distance where soil type may change.

Site location: _____

Date: _____ Time: _____ AM PM

Competent Person: _____

Where was the soil sample taken from: _____

Excavation: Depth: _____ Width: _____ Length: _____

Visual Test

Particle type: Fine grain (cohesive) _____ Course grained (sand/gravel) _____

Water conditions: Wet: ___ Dry: ___ Surface water present: ___ Submerged: ___

Previously disturbed soils? ___ Yes ___ No

Underground utilities? ___ Yes ___ No
If yes, what type? _____

Layered soils? ___ Yes ___ No Layered soil dipping into excavation? ___ Yes ___ No

Excavation subjected to vibrations? ___ Yes ___ No
If yes, from what? _____

Crack-like openings or spalling observed? ___ Yes ___ No

Conditions that may create a hazardous atmosphere? ___ Yes ___ No
If yes, identify the condition and the source: _____

Surface encumbrances? ___ Yes ___ No
If yes, what type: _____

Work to be performed near public vehicular traffic? ___ Yes ___ No

Possible confined space exposure? ___ Yes ___ No

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(Soils Analysis Checklist Continued)

Manual Test

Plasticity: ___ Cohesive ___ Non-cohesive

Dry strength: ___ Granular (crumbles easily) ___ Cohesive (Broken with difficulty)

Note: The following unconfined compressive strength test should be performed on undisturbed soils.

Thumb test used to estimate unconfined compressive strength of cohesive soils: ___ Yes; ___ No

___ Type A - Soil indented by thumb with very great effort.

___ Type B - Soil indented by the thumb with some effort.

___ Type C - Soil easily penetrated several inches by the thumb with little or no effort.
If soil is submerged, seeping water, subjected to surface water, runoff,
exposed wetting.

Penetrometer or Shearvane used to estimate unconfined compressive strength of cohesive soils:

Test performed: ___ Yes; ___ No

Device used: _____

___ Type A - Soil with unconfined compressive strength of 1.5 tsf or greater.

___ Type B - Soil with unconfined compressive strength of 0.5 tsf to 1.5 tsf.

___ Type C - Soil with unconfined compressive strength of 1.5 tsf or less.
If soil is submerged, seeping water, subjected to surface water, runoff, exposed
wetting.

Wet Shaking Test: Used to determine the percentage of granular and cohesive materials.
loam.

Compare results to soil textural classification chart to determine soil type.

___ Type A - clay, silty clay, sandy clay, clay loam.

___ Type B - angular gravel (similar to crushed rock) silt, silt loam, sandy loam, silty clay
loam and sandy clay loam.

___ Type C - granular soil including gravel, sand, and loamy sand.

___ % granular ___ % cohesive ___ % silt

*Note: Type A - no soil is type "A" if soil is fissured; subject to vibrations; previously disturbed; layered
dipping into the excavation on a slope of 4H: 1V.*

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(Soils Analysis Checklist Continued)

Soil Classification

Type A ___

Type B ___

Type C

Selection of Protective System (Appendix D)

Protective System:

___ Sloping (appendix B) Specify angle

___ Timber shoring (appendix C)

___ Aluminum hydraulic shoring (appendix D)

___ Other; Specify/describe: _____

Note: Although OSHA will accept the above test in most cases, some states will not. Check your state requirements for excavations/trenching.

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PERMIT

Date: _____ Project: _____

Weather: _____ Crew Leader Signature: _____

Protective system used: Trench shield/box; Wood shoring; Sloping;
 Aluminum shoring; Other, Specify: _____

Purpose of trench/excavation: Drainage; Water; Sewer; Gas;
 Fire Loop; Foundation; _____ Other, specify: _____

Was a visual soil test made: Yes; No If yes, what type: _____

Was a manual soil test performed: Yes; No If yes, what type: _____

Type of soil: _____ Soil strength: _____

Surface encumbrances: Yes; No If yes, what type: _____

Water conditions: Wet; Dry Submerged

Hazardous atmosphere exist: Yes; No If yes, follow confined space entry procedures policy,
complete Confined Space Entry Permit, monitor for toxic gas(es).

Measurements of excavation/trench: _____ Depth; _____ Length; _____ Width

Is there a ladder, in the excavation/trench, within 25 feet of the employees: Yes; No

Is excavated material stored 2 feet or more from the edge of excavation: Yes; No

Are employees exposed to public vehicular traffic: Yes; No
If yes, high visibility vest required.

Are other utilities identified and protected: Yes; No; Not required

Are sewer or natural gas lines exposed: Yes; No If yes, refer to the confined space entry
procedures policy, complete confined space entry permit, monitor for toxic/explosive gases(es).

Periodic Inspection: Yes; No Last date performed _____

Did employees receive training in the excavation: Yes; No

Comments: _____

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IDOL EXCAVATION INSPECTION REPORT**

Date: _____ Time: _____ AM/PM

Project: _____

Compliance Officers Name: _____

ID Number: _____

Office Address /Phone #: _____

Did IDOL Compliance Officer wait for Crew Leader to be present?

Yes; No; How long did he wait?

Was an opening conference conducted? Yes; No

Project's Competent Person present during inspection: Yes; No

Dimensions of trench/excavation that employees were in: Depth: _____ Width

Type of Soil: A; B; C

Type of soil test taken: Pocket Penetrometer; Other, specify: _____

Where employees in excavation/trench when IDOL /OSHA arrived? Yes; No

Water in excavation? Yes; No; If yes, controlled? Yes; No

Where pictures taken? Yes; No; How many?

Spoil back 2 feet from edge of excavation? Yes; No

Did project's competent person perform daily excavation inspection? Yes; No

If not, why not: _____

If depth over 5 feet: Sloped? Yes; No; What angle? _____

Shored? Yes; No; What system? _____

Other? _____

Ladder in excavation? Yes; No

All employees wearing hard hats? Yes; No

Were barricades and signs in proper places? Yes; No

Comments: _____

Crew Leader/Competent Persons Signatures : _____

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DAILY EXCAVATION INSPECTION REPORT

To be completed by Supv. / Crew Leader Competent in Excavations

Date: _____ Time: _____ AM/PM

Project: _____

Address: _____

Dimensions of trench/excavation that employees work in: Depth: _____ Width: _____

Perimeter Protection in place: Yes; No:

Water in excavation? Yes; No; If yes, controlled? Yes; No

If yes employees wearing adequate protection from water? Yes; No

Spoil back 2 feet from edge of excavation? Yes; No

If depth over 5 feet:

Trench Protection firmly in place? Yes No

Sloped? Yes; No; What angle? _____

Shored? Yes; No; What system? _____

Other? _____

Ladder in excavation every 25ft? Yes; No

All employees in excavation wearing hard hats? Yes; No

Comments: _____

Competent Person Signature : _____