



## Trenching & Excavating Safety Procedure

### 1. Purpose

This program establishes the minimum requirements for practices and procedures to assure the safety of those who work in or around excavations as part of their job duties. It also serves to protect University faculty, staff, students and visitors who may work or travel in the vicinity of an excavation or trench.

University of Notre Dame faculty, staff, or students shall not perform excavation or trenching operations in their capacity as faculty, staff, or students of the University. Trenching and excavating on campus shall only be performed by outside contractors that are approved by the University's Contractor Safety Program. They may for purposes of inspection or troubleshooting enter an excavation or trench under the guidance of this program.

### 2. Scope

This program sets forth the practices required for trenches or excavations on the University of Notre Dame campus. Faculty, staff, students, visitors and contractors working under University supervision shall comply with all elements of the University of Notre Dame Trenching and Excavating Safety Program.

This program does not cover construction sites that are under the exclusive control of a construction manager, prime contractor or other entity employing a project specific safety program.

### 3. Definitions

#### 3.1. Aluminum Hydraulic Shoring

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.

#### 3.2. Benching

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.

#### 3.3. Cave-in

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

One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that may affect employees and the general public, and who has authority to take prompt corrective measures to eliminate them.

### 3.5. Excavation

Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

### 3.6. Failure

The breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

### 3.7. Fissured

Refers to soil that has a tendency to break along definite planes of fracture with little resistance or a material that exhibits open cracks such as tension cracks in an exposed surface.

### 3.8. Hazardous Atmosphere

Atmosphere that is oxygen deficient, potentially explosive, flammable, poisonous, corrosive, oxidizing, irritating, toxic or otherwise harmful in a manner that may result in death or serious injury.

### 3.9. Protective Systems

Methods for protecting personnel working in excavations from cave-in, material falling or rolling in from the exterior or from collapse of adjacent structures. Protective systems include the use of support systems, sloping and benching systems, shield systems and other systems that provide the necessary protection.

### 3.10. Registered Professional Engineer

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.

### 3.11. Shield

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 a permanent structure or can be designed to be portable and moved along as work progresses. Also known as trench boxes or trench shields.

### 3.12. Shoring

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.

### 3.13. Sloping

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 varies with



differences in such factors as the soil type, environmental exposure conditions, and application of surcharge loads.

#### 3.14. Soil Type A

Most stable: clay, silty clay, and hardpan (resists penetration). No soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed, or has seeping water.

#### 3.15. Soil Type B

Medium stability: silt, sandy loam, medium clay and unstable dry rock; previously disturbed soils unless otherwise classified as Type C.

#### 3.16. Soil Type C

Least stable: gravel, loamy sand, soft clay, submerged soil or dense, heavy unstable rock, and soil from which any water is seeping.

#### 3.17. Trench

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 is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less, the excavation is also considered to be a trench.

#### 3.18. University Representative

A designated University employee who has responsibility for the project or work for which excavation or trenching is required.

#### 3.19. Utilities Locate and Excavation Permit Program

Permit program administered by the University's Utilities Department to ensure the protection of underground utility systems and employee/contractor safety. A Utilities Locate and Excavation Permit is required for any excavation performed on campus and must be filed a minimum of two (2) full working days prior to the start of work. The permit procedure is located on FDO's website.

### 4. Responsibilities

#### 4.1. Risk Management & Safety Department (RM&S)

RM&S has the primary responsibility for assisting departments in implementation of this procedure through coordinating training and consultation. This includes:

- On site evaluation to monitor use of safe work practices and procedures
- Assisting with atmospheric testing and equipment selection as needed
- Providing or identifying appropriate training for Competent Persons and staff
- Providing technical assistance as needed
- Reviewing and updating the program at least annually.

## 4.2. Utilities Department

4.2.1 The Notre Dame Utilities Department has the responsibility to implement and maintain the Utilities Locate and Excavation Permit Procedure. This includes:

- Administering the Utilities Locate and Excavation Permit Procedure, including receiving, reviewing and approving permit requests.
- Coordinating the locating and marking underground utilities on University owned property, be it by Utilities, other departments or other utility system operators (e.g., natural gas, communications, etc.).
- Reviewing and updating the program at least annually.

4.2.2 Regularly verifies that contractors are in compliance with this Excavating and Trenching Safety Program. The frequency to be commensurate with the extent and risk severity of the work.

## 4.3. Competent Person

### 4.3.1 General

- Shall be trained in and knowledgeable of excavation and the trenching standard, and other programs that may apply (e.g., Hazard Communication, Fall Protection, Personal Protective Equipment).
- Performs and documents a daily excavation and trenching safety checklist and inspects the excavation for evidence of a situation that could cause a potential cave-in, protective system failure, hazardous atmospheres, or other hazardous conditions. This shall be performed prior to the start of work, as necessary throughout the shift, and after every rainstorm or other hazard increasing occurrence.
- Shall assure that the location of underground installations or utilities have been properly located and that a Locate and Excavation Permit issued by Utilities has been granted.
- Shall identify and ensure the use of adequate protective systems, work methods and personal protective equipment (PPE) on the excavation site.
- Ensures all workers (contractors, employees, etc.) under their supervision involved in excavation/trenching activities are aware of and directed to follow this program.

### 4.3.2 University Competent Persons

- Ensures that the Excavation and Trenching Safety Checklist (Appendix A) is completed by a University competent person if University employees are entering the excavation or trench.
- Ensures that daily inspections of excavations and trenches are completed whenever Notre Dame employees will be entering the excavation or trench on Notre Dame owned worksites.
- Completes the ComplyND excavation and trenching safety training when overseeing or working in the vicinity of excavation and trenching activities.

## 5. General Requirements

- 5.1. University employees should avoid entering trenches. However, there may be times when a University employee is required to perform an inspection of underground utility assets. This is permitted, as long as all other non-entry means have been deemed infeasible for the particular purpose of entering. The length of time while in the trench shall be kept to a minimum, commensurate with the purpose of entering. The entrant shall work collaboratively with the competent persons involved in the excavation to minimize the potential risks.
- 5.2. Prior to a University employee entering an excavation, a University Competent Person shall perform an inspection of the excavation.
- 5.3. Prior to any personnel (University employee and/or contractors) entering an excavation or trench, NDPD dispatch shall be notified. NDPD Dispatch shall maintain a log of active excavation and trench entries when informed of an entry. The following information shall include:
  - 5.3.1. Date
  - 5.3.2. Location
  - 5.3.3. When they are entering/When they are exiting
  - 5.3.4. Who is entering the excavation or trench (Company/Department)
  - 5.3.5. Name of contact/contact number
- 5.4. All equipment, materials, supplies, permanent installations (buildings or roadways), trees, brush, boulders and other objects at the surface that could present a hazard to employees working in the excavation shall be removed or supported as necessary to protect workers.
- 5.5. Employees are not allowed in the excavation while heavy equipment is digging. Employees shall not work under loads being lifted or moved by heavy equipment used for digging or lifting. Employees are required to stand away from equipment that is being loaded or unloaded to avoid being struck by falling materials or spillage.
- 5.6. The competent person shall visually inspect all sidewalls of an excavation for signs of soil cracks, water seepage, ledges, soft pockets, (clay over sand or gravel), loose material, and evidence of prior collapse. Personnel shall not enter an excavation when these indicators of sidewall stress are present. Entrance into an excavation shall be made only when the sidewalls have been stabilized or the hazard has been eliminated.
- 5.7. If the soil appears to be contaminated (unusual appearance, color, texture or odor) the competent person shall immediately cease all operations and contact the University Representative. The RMS Environmental Team and FDO shall be contacted to ensure that proper remediation takes place.
- 5.8. If workers will enter an excavation that is greater than 5 feet deep, a protective system shall be implemented.
- 5.9. Excavation shall be done in a manner that does not endanger workers, underground utilities or other underground structures. Exposed utilities shall be protected by barricading, shoring, suspension, or other means as necessary.
- 5.10. Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier.

5.11. Each employee at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.

5.12. Any contact or damage to an underground utilities shall be immediately reported to the Notre Dame Utilities Department. The excavation shall not be backfilled until ND Utilities has evaluated the damage, the damage has been repaired and the Notre Dame Utilities Department has inspected and approved the repair. If property damage occurs, it shall be reported through the RM&S Incident Reporting System.

5.13. All records and documentation shall be made available upon request.

## 6. Inspections

6.1. See Section 4.3 for trenching and excavating inspection requirements.

## 7. Soil Classification/Management

7.1. All soils on campus shall be considered to be Type C soil.

7.2. A soil disposal plan shall be developed prior to excavating. It shall outline where and how the soil will be managed (e.g., Hazardous waste, non-hazardous waste, or non-hazardous fill dirt).

7.3. If concrete and asphalt will be removed, a plan shall be developed for this waste.

7.4. If roll offs, dumpsters, or other containers are required for soil handling, these units shall be procured or ordered prior to the start of the excavation.

## 8. Protective Systems

8.1. Employees shall not enter a vertical excavation greater than 5 feet in depth but less than 20 feet in depth unless the following has been completed:

- A competent person has examined the ground and found no indication of potential cave-in.
- A protective system such as sloping, shielding or shoring is in place. If a sloping protective system is used for such excavations, the slope shall be at most 1½ horizontal to 1 vertical (34 degrees measured from the horizontal). See Figure 1.

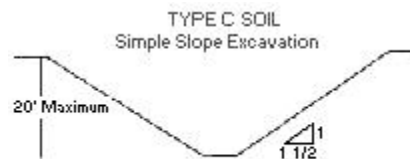


Figure 1

- 8.2. Excavations greater than 20 feet in depth shall be reviewed by a registered professional engineer to design the protective system. These designs shall be stamped, signed and include a plan indicating the size, type, and configurations of the material to be used in the protective system. The identity of the registered professional engineer who designed the system shall be provided for the project records.
- 8.3. Before and during use, protective systems such as shields and shoring systems along with their components shall be inspected in accordance with the manufacturer instructions. Defective or questionable shields, shoring or other associated components shall not be used.
- 8.4. Shoring shall be installed as the excavation proceeds. If there is a delay between digging and shoring, no one shall be allowed to enter the unprotected excavation. All shoring shall be installed from the top down and removed from the bottom up. The shoring shall extend at least 18 inches above the vertical side of the trench or the lower portion of a proper slope. The system shall be inspected frequently by the competent person when in use.
- 8.5. When the protective system is removed, the excavation shall be backfilled immediately.
- 8.6. Timber shoring shall not be used at the University of Notre Dame unless part of an approved contractor building plan. Hydraulic shoring is permitted because workers do not have to enter a trench to install it.
- 8.7. All protective systems shall be designed or approved by a registered professional engineer or is based on tabulated data that has been prepared or approved by a registered professional engineer or the original manufacturer.
- 8.8. The design of a protective system drawn from a manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer. (Documentation shall be available.) Deviation from specifications, recommendations and limitations issued or made by the manufacturer shall be allowed only after the manufacturer issues specific written approval.
- 8.9. To limit soil movement in case of a cave-in, the shield system shall not have any lateral movement when installed. The shield shall extend at least 18 inches above the vertical side of the excavation or lower portion of a proper slope. Shields may be a maximum of two feet above the bottom of an excavation if they are designed to resist loads at the full depth of the trench and if there are no indications of caving under or behind the shield. The open end of the shield shall be protected from exposed excavation walls. To prevent cave-ins, the back walls may be sloped or engineered (registered professional engineer or original manufacturer endplate may be installed as necessary).
- 8.10. Workers are not allowed in the shield or trench during installation or removal, or during any movement of the shield system. When workers are in the trench, they shall remain inside the shield and shall leave before the box is moved.
- 8.11. Excavations below the level of the base or footing of any foundation of an adjacent structure or an adjacent retaining wall shall not be permitted unless:
  - 8.11.1. A support system such as underpinning is provided and designed by a registered professional engineer (documentation available).

- 8.11.2. The excavation is in stable rock.
  - 8.11.3. A registered professional engineer determines that the structure will not pose a hazard (documentation available).
9. Ingress/Egress
- 9.1. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are four (4) feet in depth or greater.
  - 9.2. Safe means of egress shall be provided so that no more than 25 feet of lateral travel is necessary for workers to reach the egress.
  - 9.3. If a ladder is used for access or egress it shall be secured and extend at least 36 inches above the landing.
  - 9.4. Structural ramps that are used by workers shall be designed by a competent person who is qualified in structural design.
10. Hazardous Atmospheres
- 10.1. If there is any possibility that the trench or excavation could contain a hazardous atmosphere, atmospheric testing shall be conducted prior to entry. Conditions that might warrant atmospheric testing would be if the excavation was made in a landfill area or if the excavation is adjacent to sources of contamination (e.g., sewage or fuel leaks).
  - 10.2. Testing shall be conducted before employees enter a trench that is 4 feet deep or more and should be done regularly to ensure that the trench remains safe. The frequency of testing should be increased if equipment is operating in the trench that could produce airborne contaminants.
  - 10.3. If Notre Dame employees are entering a trench or excavation, atmospheric testing shall be completed with a Notre Dame owned and maintained air monitor. The air monitor shall be bump tested prior to use and be calibrated within the last 30 days.
  - 10.4. Notre Dame employees shall not enter a trench or excavation that contains a hazardous atmosphere.
  - 10.5. Contact NDFD if there are any questions on atmospheric testing and air monitors.
11. Water Accumulation
- 11.1. Diversion ditches, dikes, or other suitable means shall be constructed to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation.
  - 11.2. Personnel shall not work in excavations in which there is accumulated or accumulating water unless appropriate precautions have been taken to protect personnel from hazards presented by water.
  - 11.3. If the excavation is subject to runoff from heavy rains, it shall be inspected by a competent person to ensure that the hazards from water accumulation are properly controlled.



## 12. Protection of Workers from Materials and Traffic

12.1. Adequate protection shall be provided to protect workers from loose rock or soil that could pose a hazard by falling or rolling from an excavation. Such protection shall consist of:

- Scaling to remove loose materials;
- Installation of protective barricades, such as wire mesh or timber, at appropriate intervals on the face of the slope to stop and contain falling materials; or
- Benching sufficient to contain falling material.

12.2. Protection shall be provided by keeping materials at least 2 feet from the edge of excavations, by the use of restraining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both, if necessary.

12.3. Materials and equipment may, as determined by the competent person, need to be stored further than 2 feet from the edge of the excavation if a hazardous loading condition is created on the face of the excavation.

12.4. Workers exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

## 13. Protection of the Public

13.1. Excavations shall be isolated from public access by a substantial physical barrier. Barricades, lighting and posting shall be installed as appropriate prior to the start of excavation operations. All temporary excavations shall be backfilled as soon as possible.

13.2. Guardrails, fences, or barricades shall be installed around the excavation to prevent unauthorized entry. Use of barricade tape alone is not considered a sufficient method of isolation when the excavation is unattended. Warning lights or other illumination shall be used as necessary for the safety of the public at night.

13.3. Wells, holes, pits, and similar excavations shall be effectively barricaded or covered and posted.

## 14. PPE Requirements

14.1. Personal Protective Equipment shall be determined by conducting a hazard analysis on the excavation project. This shall be conducted by the competent person.

## 15. Training

15.1. An employee who is overseeing an excavation and trenching operation shall complete competent person training through a qualified third party.

15.2. Any employee working in or around an excavation shall attend, at a minimum, trenching and excavation safety awareness training prior to beginning related work. The training is provided by RM&S (ComplyND) and covers the potential hazards encountered when working in and around excavations and the procedures that need to be followed in order to avoid these hazards.



15.3. Any employee involved in trenching and excavating activities shall attend relevant health and safety training (e.g., Hazard Communication, Fall Protection, and Personal Protective Equipment).

15.4. Refresher training shall be provided:

- 3 years after initial training was completed.
- If OSHA's 29 CFR 1926 Subpart P regulation is changed.
- If an employee demonstrates a lack of proficiency.

15.5. All excavation training documentation shall include the names of the trainees, date(s) of training, the signature of the trainer and verification of each trainee's understanding (quiz, skill demonstration, etc.) Training completed on ComplyND is exempt from having a physical signature.

## 16. RM&S Program Evaluation

16.1. The Trenching & Excavation Safety Program shall be reviewed at least annually and updated as necessary.

16.2. A field audit of the Trenching & Excavation Safety Program shall be conducted by RM&S and/or FDO (Appendix B). The audit shall include direct observation of excavation methods and verification that procedures are appropriate, understood and implemented. Any deviations or deficiencies shall be corrected immediately.

## 17. Record Retention

17.1. Records shall be retained for three years. This includes the following:

- 17.1.1. All training documentation
- 17.1.2. All Excavation and Trenching Safety Checklists
- 17.1.3. All Excavation and Trenching Field Audits

## 18. Resources

18.1. The Occupational Safety and Health Administration, 29 CFR 1926.650-652 *Definitions, Specific Excavation Requirements, Requirements for Protective Systems.*

18.2. The Occupational Safety and Health Administration, 29 CFR 1926.501(b)(7)(i-ii) *Definitions, Duty to Have Fall Protection*



### Revision Log

History	Effective Date
Trenching & Excavation procedure developed	February 2020

## Appendix A

### Trenching & Excavation Safety Checklist

A Competent Person shall perform this excavation safety evaluation whenever a Notre Dame employee is to enter an excavation or trench. All precautions and entry conditions must be met prior to entry or N/A'd.

Project Name: \_\_\_\_\_

Contractor: \_\_\_\_\_

ND Competent Person (Print): \_\_\_\_\_

Date: \_\_\_\_\_ Time \_\_\_\_\_

Section	Description	Yes	N/A
<b>General Site Information</b>			
1	a. Is the contractor's competent person onsite during excavation & trenching operations?		
	b. Excavation greater than 5 feet have protective systems in place?		
	c. Have provisions been made to keep soil piles and equipment at least 2 feet from the edge of an excavation?		
	d. Workers and machinery protected from traffic?		
	e. Workers are cleared and away from overhead hazards?		
	f. Excavation greater than 20 feet in depth have engineered protection systems?		
	g. Engineering designs for sheeting & or manufacturers data on trench box available on site?		
	h. Adequate signs posted and barricades provided?		
	i. Has a PPE assessment been completed and are workers wearing the appropriate PPE?		
	j. Is the contractor competent person performing daily inspections on the work area and protective systems?		
<b>Utilities:</b>			
2	a. Has the Utility Locate Request Permit been completed?		
	b. Have the location of utilities been marked?		
	c. Overhead lines located, noted and reviewed with operator.		
	d. Underground installations protected, supported, or removed when excavation is open.		
<b>Wet Conditions</b>			
3	a. Precautions taken to protect workers from water accumulation if applicable (continuous dewatering).		
	b. Surface water or runoff diverted or controlled to prevent accumulation in the excavation.		
<b>Means of Access and Egress:</b>			
4	a. Lateral travel to means of egress no greater than 25 feet in excavations four feet or more in depth.		
	b. Ladders use in excavations are secured and extended three feet above the edge of the trench?		
	c. Are structural ramps designed and inspected by the competent person?		
<b>Environmental Hazards</b>			
5	a. There is no evidence of odors, oil or contaminated soil in the excavation.		
	b. Excavation greater than 4 feet in depth does not contain potential hazardous atmosphere.		
<b>Condition</b>		<b>Limit</b>	
Oxygen		19.5 - 22%	
Flammable		0% LEL	
CO		≤ 13 ppm	
H <sub>2</sub> S		≤ 0.5 ppm	
VOC		≤ 100 ppm	

**ALL PROBLEMS OR CONCERNS SHALL BE ADDRESSED WITH A CORRECTIVE ACTION**

Provide detailed description of deficiencies and corrective action initiatives required for all items

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ND Competent Person Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix B

### Trenching & Excavation Field Audit

**Project Name:** \_\_\_\_\_  
**ND/Contractor Competent Person:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_  
**Date:** \_\_\_\_\_ **Time:** \_\_\_\_\_

Audit Questions	Yes	No	N/A	Comment (If no, please explain)
1. Has the Utility Locate Request permit been completed?				
2. Does the contractor have a competent person on site?				
3. Are daily inspections being completed by the contractor competent person?				
4. Is the excavation or trench isolated from public access by a substantial physical barrier?				
5. If excavation is over 5 feet, are protective systems in place?				
6. If contractors will be entering an excavation or trench, has NDPD dispatch been notified prior to entry?				
7. Are underground utilities protected, supported, or removed when excavation is open?				
8. Lateral travel to means of egress not greater than 25 feet in excavations four feet or more in depth?				
9. Are ladders secured and extend at least 36 inches above the landing?				
10. Are materials at least 2 feet from the edge of the excavation?				
11. Has air monitoring been conducted in an excavation greater than 4 feet in depth with potential hazardous atmosphere?				
12. If the excavation or trench is deeper than 4 feet and contractors are working within 6 feet of the edge, is fall protection being utilized?				

**Completed by:** \_\_\_\_\_

**Signature:** \_\_\_\_\_