



TRENCHING AND SHORING PLAN

Department of Environmental Health & Safety

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REVISED MARCH 2004

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Appendices

APPENDIX A – OSHA Excavating Standard 29 CFR 1926.650-652

APPENDIX B – Annotated Code of the Public General Laws of Maryland Article 78 Subtitle
28A, "Underground Facilities"

APPENDIX C - BOCA National Building Code Chapter 33 Section 3304

APPENDIX D – Maryland Underground Utility Damage Prevention Act

Emergency and Assistance Telephone Numbers

FIRE - RESCUE - EMERGENCY MEDICAL SERVICE : 911

At the emergency blue-light and yellow phones located around campus, press the emergency button to be connected to the University Police who can contact 911 for you, or dial 911 on the key pad to be connected directly to the 911 Center. Give the dispatcher all of the requested information.

FOR OTHER EMERGENCIES (Contact the TUPD): (410) 704-2133

Department of Environmental Health and Safety (410) 704-2949

(Industrial Hygiene, Occupational Safety, Environmental Affairs, Fire Safety, Radiation Safety, Insurance Services, Accident Investigation and Safety Education)

University Health Center - Occupational Health (410) 704-2466

(Medical Consultation and Evaluation)

Dept. of Facilities Management - Work Control Center (410) 704-2484

MISS UTILITY (800) 257-7777

(Marking of all underground utilities in Maryland, Washington, D.C., Delaware and Northern Virginia)

Policy Statement

I. Purpose

This is a statement of official University policy to establish the process for compliance with the Occupational Safety and Health Administration (OSHA) regulation, "Excavations, Trenching and Shoring", 29 CFR 1926.650, .651, and .652 as enforced by the Maryland Occupational Health and Safety program (MOSH), with the provisions of the Annotated Code of the Public General Laws of Maryland Article 78 Subtitle 28A, "Underground Facilities", with the BOCA National Building Code Chapter 33 Section 3304 and the Maryland Underground Utility Damage Prevention Act.

II. Scope

The Towson University Trenching & Shoring Plan will apply to all faculty, staff and students who are involved in excavation operations on property owned and/or operated by Towson University and operations associated with the campus that are located in the State of Maryland. Provisions of OSHA regulations 29 CFR 1926.650, .651 and .652 for "Excavation, Trenching and Shoring" will apply, unless more stringent safety regulations for that jurisdiction are in effect.

Contractors involved in excavation operations on University property are required to comply with all applicable provisions of OSHA/MOSH regulations as per their contract.

III. Policy

The University is dedicated to providing safe work facilities for students and employees, and complying with federal and state occupational health and safety standards. Administrators, faculty, staff and students all share a responsibility to reduce the hazards associated with excavations.

IV. Duties and Responsibilities

1. Department of Environmental Health and Safety (EHS):

- Provide consultation;
- Prepare the Trenching and Shoring Plan with periodic review and revisions as needed;
- Distribute the Trenching and Shoring Plan to each affected department for distribution to all individuals who are authorized by the department to excavate;
- Investigate and document all reported accidents and/or near-miss accidents that are directly or indirectly related to trenching; and,
- Coordinate training and retraining of those who may be involved in excavations.

2. Department Heads:

- Designate a supervisor to be in charge of each excavation; and,
- Assure that necessary resources are available to the designated supervisor to allow for compliance with this plan.

3. Designated Supervisors:

- Implement all provisions of the Trenching and Shoring Plan for work areas under their control;
- Receive training for "Competent Person" for trenching as defined by OSHA.
- Act as the "Competent Person" for excavation sites under their control;
- Assure that the equipment necessary to complete an excavation safely is available and in good condition;
- Assure that all underground utility installations such as sewer, telephone, fuel tanks, electric, gas, and water lines are located and marked before excavation begins;
- Receive written approval from the Department of Facilities Management and EHS for digging, trenching or excavation on the TU campus.
- Conduct soil tests to determine soil type;
- Ensure that underground installations are protected, supported or removed while the excavation is open. Notify Facilities Management when utility systems are exposed during the excavation process to allow the location and condition of the utility to be evaluated;
- Ensure worker protection and compliance with other applicable safety plans, programs and guidelines;
- Ensure protection of the public with appropriate barricades;
- Determine what protective systems will be used to prevent cave-ins;
- Conduct daily inspections of excavations, the adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions; and,
- Immediately notify Work Control and the TUPD in the event a utility system is damaged during the excavation process on the TU campus.

4. The Department of Facilities Management:

- Review project concepts and designs for potential impact to utility systems on Towson University property.
- Approve project as appropriate from a utility standpoint, or recommend changes to projects if there are conflicts with utility systems.
- Provide written authority to proceed with excavation if the project impact to utilities is acceptable;
- Coordinate the marking of underground utilities on TU campus;
- Provide for the marking of underground utilities under its authority;
- Notify TUPD, EHS and BGE in the event of a broken gas line;
- Inspect utility systems exposed during the excavation process;

- Review utility repair proposals and approve if acceptable, or recommend repair procedures. Inspect utility repairs after they are completed and prior to covering them; and,
- Interface with contractors under its control to monitor compliance with this OSHA/MOSH regulation;

- Provide assistance with the identification and marking of underground telecommunications lines.

5. Employees:

- Complete all safety training requirements and request further instruction if unclear on any part of the Trenching and Shoring Plan;
- Use appropriate safety and personal protective equipment (PPE);
- Adhere to the requirements of the Trenching and Shoring Plan; and,
- Report all work place injuries and unsafe conditions.

V. Information

EHS will assist any Department or individual requesting guidance or training to satisfy implementation of this policy.

Call EHS at (410) 704-2949 or send electronic mail to safety@towson.edu.

Glossary of Terms

Accepted Engineering Practices: the standards of practice required by a Registered Professional Engineer.

Aluminum Hydraulic Shoring: a manufactured shoring system consisting of aluminum hydraulic cylinders (cross braces) used with vertical rails (uprights) or horizontal rails (wales). Such a system is designed to support the sidewalls of an excavation and prevent cave-ins.

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

Benching (Benching System): a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or more horizontal steps, usually with vertical or near-vertical surfaces between levels.

Cave-in: the movement of soil or rock into an excavation, or the loss of soil from under a trench shield or support system, in amounts large enough to entrap, bury, or otherwise injure and immobilize a person.

Competent Person: one who has been trained to identify existing and predictable hazards in the workplace, or working conditions that are unsafe for workers, and who has the authority to have these hazards corrected, stopping the work if necessary. The Designated Supervisor of an excavation is chosen by the department and serves as the Competent Person for the purposes of this program.

Cross Braces: the horizontal members of a shoring system installed from side to side of the excavation. The cross braces bear against either uprights or wales.

Department: any department or unit at the university that conducts work in excavations.

Designated Supervisor: the individual within the department that will oversee excavation work and that is responsible for assuring compliance with the Trenching and Shoring program.

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

Faces or Sides: the vertical or inclined earth surfaces formed as a result of excavation work.

Failure: the movement or damage through breakage, displacement or permanent deformation of a structural member or connection that makes it unable to support loads.

Hazardous Atmosphere: an atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, that may cause death, illness, or injury.

Kickout: the accidental movement or failure of a cross brace.

Layered Geological Strata: Where soil types are configured in layers. The soil should be classified on the basis of the weakest soil layer classification. Each layer may be classified individually if a more stable layer lies below a less stable layer. (See Soil Types)

Protective System: a method of protecting workers from cave-ins, from material that could fall or roll from an excavation face 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.

Ramp: an inclined walking or working surface that is used to gain access to one point from another. A ramp may be constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer: a person who is registered as a Professional Engineer in the state of Maryland.

Soil Types:

Type A - Most stable: clay, silty clay and hardpan. No soil is Type A if it is fissured, is subject to vibration, has previously been disturbed or has seeping water.

Type B - Medium stability: silt, sandy loam, medium clay and unstable dry rock. Previously disturbed soils, except those that would be classified as Type C. Soil that meets the requirement of Type A soil but is fissured or subject to vibration.

Type C - Least stable: gravel, sand, loamy sand, soft clay, submerged soil or dense unstable rock, or soil from which water is freely seeping.

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

Shield (Shield System): a structure used in an excavation that is able to withstand cave-ins and which will protect those working within the shield system. Shields can be permanent structures or portable units moved along as work progresses. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring System): a structure that is built or put in place to support the sides of an excavation and designed to prevent cave-ins.

Sides: See "Faces."

Sloping (Sloping System): sloping the sides of the excavation away from the excavation to protect employees from cave-ins. The required slope or angle of incline will vary with soil type, weather and surface or near surface loads that may affect the soil in the area of the trench (Such as adjacent building, vehicles near the edge of the trench).

Stable Rock: natural solid mineral material that can be excavated with vertical sides that will remain intact while exposed.

Structural Ramp: a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support System: a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data: tables and charts approved by a Registered Professional Engineer and used to design and construct a protective system.

Trench Box or Shield: See "Shield."

Uprights: the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales: horizontal members of a shoring system placed in the direction of the excavation face whose sides bear against the vertical members of the shoring system or earth (the uprights or sheeting).

Information and Training

All personnel involved in trenching or excavation work will be trained in the requirements of this plan. Training will be performed before anyone is assigned duties in excavations. Call EHS at (410) 704-2949 for assistance in training arrangements.

I. Training of the Designated Supervisor

All Designated Supervisors of trenches and excavations will meet the OSHA requirements for a "Competent Person."

Designated Supervisors will attend "Competent Person" training conducted by an EHS approved training source such as the Maryland Fire and Rescue Institute (MFRI) or MOSH.

II. Training of Workers

Personnel who perform work in excavations will comply with the requirements of this plan and receive appropriate training that includes at a minimum:

1. Safe work practices that must be followed during work in excavations;
2. The use of personal protective equipment (PPE) that will typically be required during work in excavations, including but not limited to safety shoes, hardhats, and fall protection devices;
3. Procedures to be followed if a hazardous atmosphere exists or could reasonably be expected to develop during work in an excavation; and
4. Emergency and non-entry rescue methods, and procedures for calling rescue services.

Retraining will be performed whenever work site inspections conducted by the Designated Supervisor or EHS indicate that a worker does not have the necessary knowledge or skills to safely work in or around excavations.

The Designated Supervisor and EHS will maintain training records.

Excavation Procedures

I. Project Development and Impact to Utilities.

The Designated Supervisor will ensure that a campus project is coordinated with Facilities Management and EHS early in the programming and development stages, so that conflicts with utilities can be resolved early. The Designated Supervisor will obtain written approval from Facilities Management indicating that the impact to utilities has been reviewed and approved before proceeding with excavation.

II. Utilities and Pre-work Site Inspection.

The Designated Supervisor will inspect the site before the excavation is started to determine what safety measures are to be taken. Underground sewer, telephone, gas, water and electric lines will be located and clearly marked. The Designated Supervisor will arrange to have these utilities protected, removed or relocated as directed by Facilities Management and as may be needed to do the work safely. Excavation will be done in a manner that does not endanger the underground installations or those engaged in the work. Barricades, shoring, suspension or other means as necessary will protect utilities left in place during trenching activities.

1. Miss Utility

MISS UTILITY (800-257-7777) will be notified for sites in the State of Maryland, to arrange for the marking of underground utilities.

The Maryland Statue “Underground Utility Damage Prevention Act” states that utilities have two (2) business days from the time the locate was registered to mark the underground facilities. If there are underground utilities near the excavation site, they will be marked with paint and/or flags on the ground. Paint/Flag colors will follow the color coding below:

| APWA Uniform Color Code | |
|-------------------------|---|
| WHITE | Proposed Excavation |
| PINK | Temporary Survey Markings |
| RED | Electric Power Lines, Cables, Conduit and Lighting Cables |
| YELLOW | Gas, Oil, Steam, Petroleum or Gaseous Materials |
| ORANGE | Communication, Alarm, or Signal Lines, Cables or Conduit |
| BLUE | Water Systems |
| PURPLE | Reclaimed Water, Irrigation and Slurry Lines |
| GREEN | Sewers and Drain Lines |

State law also requires that hand digging begin at 18 inches from the marked sites.

III. Stability of Adjacent Structures.

The Designated Supervisor will take precautions as needed to protect workers, nearby buildings or other structures. A Registered Professional Engineer should evaluate these structures and recommend precautions such as shoring, bracing, or underpinning. The Designated Supervisor will ensure that the recommendations of the engineer are carried out. Plans that outline the design of such precautions approved by the engineer will be maintained on site while the work is in progress.

IV. Protection of the Public.

Barricades, walkways, lighting and signs will be provided for the protection of the public before the start of excavation operations. Guardrails, fences or barricades will be provided adjacent to walkways, driveways and other pedestrian or vehicle thoroughfares.

V. Protection of Workers in Excavations.

1. The Designated Supervisor will assure that workers are protected from hazards that may arise during excavation work.
2. Stairs, ladders or ramps will be provided when workers enter excavations over four (4) feet deep. Two (2) or more means of exit will be provided if the excavation is more than 20 feet in length. A means of exit will be provided every 25 feet of trench length.
3. A competent person, qualified in structural design, will design structural ramps used for egress or access of equipment. The ramp will be constructed in accordance with the design. Ramps with two (2) or more structural members will have the structural members that are uniform thickness and connected together to prevent displacement and will not present a tripping hazard.
4. Those workers exposed to vehicular traffic will wear warning vests made of high visibility material.
5. No one will work underneath loads handled by lifting or digging equipment. Workers will stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
6. A warning system will be used when mobile equipment is operated next to the edge of an excavation if the operator does not have a clear, direct view of the edge of the excavation.
7. Materials and equipment should be kept at least two (2) feet from the edge of the excavation with the proper protective system in place.

VI. Hazardous Atmospheres and Confined Spaces.

Workers will not be permitted to work in hazardous and/or toxic atmospheres. Such atmospheres include those with the following:

- Atmospheric oxygen concentration below 19.5% or above 23.5%.
- A combustible gas concentration greater than 10% of the lower flammable limit.

- Concentrations of hazardous substances that exceed those specified in the Threshold Limit Values (TLVs) for airborne contaminants established by the American Conference of Industrial Hygienists (ACGIH).

If there is any possibility that the trench or excavation could contain a hazardous atmosphere, the Designated Supervisor will ensure that atmospheric testing is conducted before worker entry and continuously during work. Excavations near underground storage tanks or those that contain gas pipelines will be monitored. Suitable precautions will be taken as necessary to protect workers. These precautions may include the following:

- Engineering controls such as ventilation;
- Respiratory protection; those required to wear respiratory protection must be enrolled in the Towson University Respiratory Protection Program. Enrollment in the program requires workers to:
 - Complete respiratory protection training (EHS provides training for air purifying respirators);
 - Obtain a fit test provided by EHS;
 - Complete a medical examination; and
 - Maintain annual re-certification.

VII. Full body harnesses and lifelines.

Some trenches qualify as permit-required confined spaces. The Designated Supervisor will ensure compliance with the Towson University Confined Space Plan when an excavation has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere, OR
- Contains a material that has the potential for entrapping, engulfing or suffocating an entrant, OR
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, OR
- Contains any other recognized serious or health hazard.

VIII. Personal Protective Equipment (PPE).

- The Designated Supervisor will ensure that all workers wear all required safety equipment as detailed below. Hardhats, safety eyewear, gloves, hearing protection and fall protection devices will be furnished by EHS or the worker's department or the contractor's employer. The department or employer must ensure that anyone conducting work in excavations wears safety footwear approved by the American National Standards Institute (ANSI).
- Everyone working in trenches or excavations will wear ANSI approved hardhats at all times.
- Everyone working in trenches or excavations will wear ANSI approved steel-toed shoes or boots.
- Those exposed to flying fragments, dust or other materials produced by drilling, sawing, sanding, grinding and similar operations will wear ANSI approved safety glasses with side shields.

- Those exposed to hazards produced by welding, cutting, or brazing will wear approved eye protection or a welding face shield or helmet. The Designated Supervisor will obtain a Hot Work Permit EHS by calling (410) 704-2949.
- Those workers entering deep and confined footing excavations, such as shafts and bell-bottomed holes, will wear a harness with a lifeline securely attached to it. The lifeline will be separate from any line used to handle materials. The lifeline will be attended by a person at all times while the employee wearing the lifeline is in the excavation.
- All workers will wear gloves or other suitable hand protection as determined by the supervisor or EHS.
- Workers at the edge of an excavation four (4) feet or more deep will be protected from falling by guardrails systems, fences, barricades, or other approved means.
- The supervisor or other qualified person will conduct a Workplace Hazard Assessment according to the requirements described in the Towson University Personal Protective Equipment Program.

IX. Walkways and Guardrails.

Walkways will be provided where workers or equipment are allowed to cross over excavations. Guardrails will be provided on walkways used by the general public regardless of the height above the excavation. Guardrails will be provided on walkways used only by on-site personnel if the walkway is six (6) feet or more above lower levels. Guardrails and toe boards will be provided when/if workers pass below a walkway.

X. Hazards Associated with Water Accumulation.

No one will work in excavations with standing water or where water is collecting unless the Designated Supervisor gives prior approval or instruction. Methods for controlling water accumulation will be provided and will consist of the following if anyone must work in the excavation:

1. Use of special support or shield systems approved by a Registered Professional Engineer.
2. Water removal equipment, such as well pointing, used and monitored by the Designated Supervisor.
3. Use of safety harnesses and lifelines.
4. No one will work in excavations during a rainstorm.
5. Trenches will be inspected by the Designated Supervisor after each rain and before anyone is permitted to re-enter the excavation.

XI. Protection of Workers from Falling Objects:

The Designated Supervisor will ensure that workers are protected from loose rock or soil that could fall or roll from an excavation face. Such protection will consist of:

1. Scaling to remove loose material;
2. Installation of barricades such as wire mesh or timber as needed to stop and contain falling material; OR
3. Sloping. Sloping will be used instead of barricades when practical.

Workers will be protected from excavated materials, equipment or other objects that could pose a hazard by falling or rolling into excavation. These materials or equipment will be kept at least two (2) feet from the edge of the excavation or otherwise restrained. Materials piled, grouped or stacked near the edge of an excavation must be stable and self-supporting.

XII. Inspections.

The Designated Supervisor will conduct daily inspections of excavations, adjacent area and protective systems for evidence of a situation that could result in a cave-in, failure of protective systems, hazardous atmospheres or other hazardous conditions. Inspections will be conducted before the start of work and as needed throughout the shift. Inspections will also be made after every rainstorm. These inspections are only required when the trench will be or is expected to be occupied. When a hazardous condition is found, exposed workers will be removed from the area until precautions have been taken to assure their safety.

These inspections will be documented in writing and kept on-site. They will be made available to EHS or any other authority upon request.

Requirements for Protective Systems

I. Selection of Protective Systems.

Personnel working in an excavation will be protected from cave-ins by using either an adequate sloping and benching system or an adequate support or protective system. The only exceptions are when the excavation is made entirely in stable rock or the excavation is less than four (4) feet in depth where examination of the ground by the Designated Supervisor provides no indication of a potential cave-in. The decision tree in 29 CFR 1926 Subpart P, Appendix F (See appendix A of this Plan) will be used to determine the appropriate section of protective systems used in excavations 20 feet or less in depth. A registered professional engineer must design all excavations greater than 20 feet in depth.

II. Soil Classification.

In order to design the most appropriate protective system, the Designated Supervisor will determine the soil type using a visual test with one or more manual tests. The soils in the State of Maryland have been found to be Type B and Type C. If the soil is subject to vibration or previously disturbed or saturated, a B soil must be downgraded to a C classification.

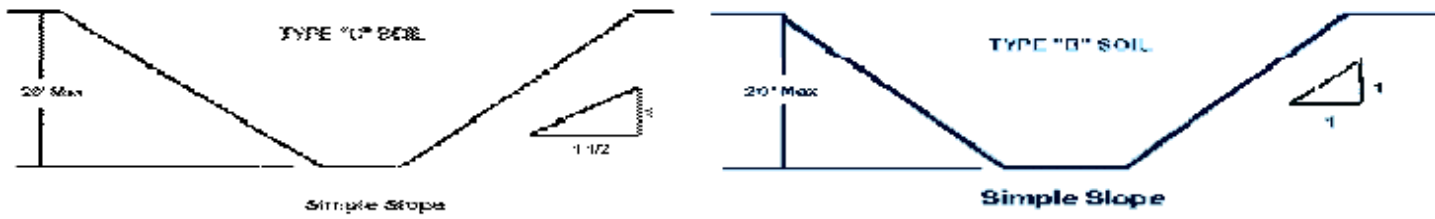
1. Visual Test

During the visual test, the entire excavation site including the soil adjacent to the site will be observed. The Designated Supervisor will check for crack-line openings along the failure zone that indicate tension crack and observe the open side of the excavation for indications of layered geologic structuring. Other conditions to look for are signs of bulging, boiling, or sloughing, as well as signs of surface water seeping from the side of the excavation or from the water table.

2. Manual Tests

- Thumb Penetration Test. When the thumb is pressed firmly into the soil and penetrates no further than the length of the nail, it is probably Type B soil. If the thumb penetrates the full length of the thumb, it is Type C. This is the least accurate of the manual test methods.
- Dry Strength Test. If a sample of dry soil is crumbled freely or with moderate pressure into individual grains it is considered granular, or Type C. Dry soil that falls into clumps that subsequently break into smaller clumps is probably clay in combination with gravel, sand or silt (Type B).
- Plasticity or Wet Thread Test. A moist sample of the soil is molded into a ball and then rolled into a thin thread approximately 1/8 inch in diameter by two inches in length. If the soil sample does not break when held by one end, it may be considered Type B. If the soil sample does break, it is considered Type C.

A pocket penetrometer, shearvane or torvane may also be used to determine the unconfined compression strength of soils.



III. Types of Protective Systems.

The following systems will be used to protect workers from cave-ins in trenches of more than four (4) feet deep. The Designated Supervisor should select the method of protection that is most suitable for the particular job site, taking into consideration soil type and surrounding structures. If the soil is not classified, then the excavation must be sloped at an angle not steeper than one and a half horizontal to one vertical.

1. Sloping.

Maximum allowable slopes for excavations less than 20 feet deep based on soil type and angle to the horizontal are as follows:

| Soil Type | Height/Depth Ratio | Slope Angle |
|-----------|--------------------|-------------|
| Type B | >1:1 | 45 |
| Type C | 1½:1 | 34 |

For Example: A ten feet deep trench in Type B soil would have to be sloped to a 45 degree angle, or sloped 10 feet back in both directions. Total distance across a trench ten feet deep would be 20 feet plus the width of the trench. In Type C soil, the trench would be sloped at a 34-degree angle or 15 feet in both directions for a total of 30 feet across plus the width of the trench.

2. Benching.

There are two types of benching:

1. Single. One level or step, not exceeding 4 feet in height.
2. Multiple. More than one level or step, each not to exceed four feet in height.

Benching can be used in conjunction with simple sloping. Benches must be below the maximum allowable slope for that soil type. For example: A ten-foot deep trench in Type B soil must be benched back 10 feet in each direction with the maximum of a 45-degree angle.

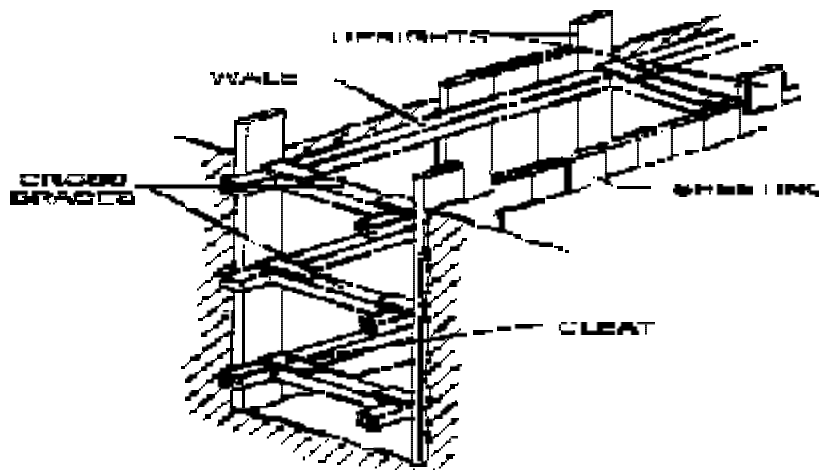
Benching is not permitted in Type C soil.

3. Shoring.

Shoring is used when the location or depth of the trench makes sloping back to the maximum allowable slope impractical. There are two basic types of shoring: timber and aluminum hydraulic.

1. Timber.

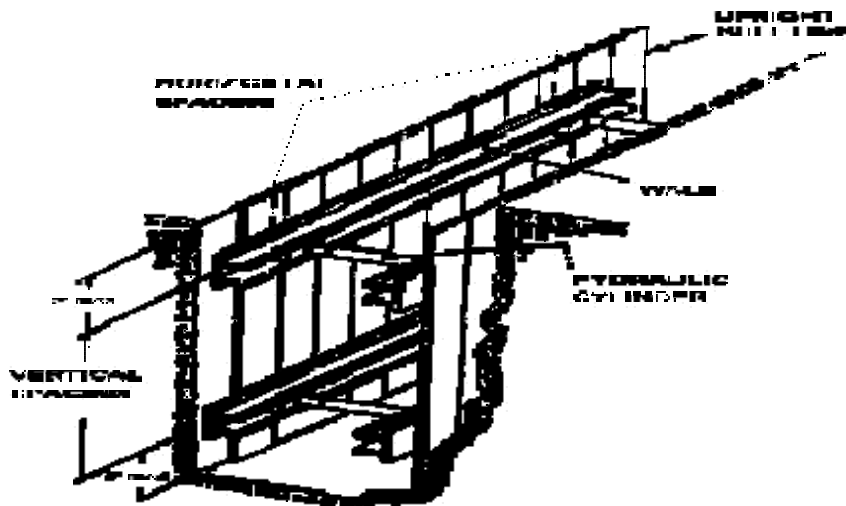
The Designated Supervisor will use the information in the tables of 29 CFR 1926 Subpart P Appendix C - Timber Shoring for Trenches. The members of the shoring system that are to be selected using the tables are the cross braces, the uprights, and the Wales where Wales are required. The Designated Supervisor will select the size and spacing of members using the appropriate table. The selection will be based on the depth and width of the trench where the members are to be installed. In most instances, the selection is also based on the horizontal spacing of the cross braces. Where a choice is available, the horizontal spacing of the cross braces must be chosen before the size of any member can be determined.



2. Hydraulic Aluminum Shoring.

- Hydraulic shoring provides a critical advantage over timber shoring because workers do not have to enter the trench to install them. They are also light enough to be installed by one worker, they are gauge-regulated to ensure even distribution of pressure along the trench line and they can be adopted easily to various trench depths and widths.
- Hydraulic aluminum shoring will be used over timber shoring at Towson University whenever feasible.
- Hydraulic Shoring Support Systems will be constructed and used in accordance with all specifications, recommendations and limitations issued by the manufacturer.

- Hydraulic shores will be installed in accordance with the 1926 Subpart P Appendix D - Aluminum Hydraulic Shoring for Trenches. The Designated Supervisor will use the tables in this standard to determine the maximum vertical and horizontal spacing that may be used with various aluminum member sizes and various hydraulic cylinder sizes.
- All shoring will be installed from the top down and removed from the bottom up. The Designated Supervisor will inspect all hydraulic shoring at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts. This inspection will be documented in writing. The top cylinder of hydraulic shoring will be no more than two feet from the top edge of the excavation. Two feet of trench may be exposed beneath the bottom of the rail or plywood sheeting, if used.



4. Shielding.

Trench boxes are different from shoring because instead of shoring up or otherwise supporting the trench face, they are intended primarily to protect workers from cave-ins. Trench boxes are generally used in open areas, but they may be used in combination with sloping and benching. The Designated Supervisor will ensure that the following safety measures are taken:

1. Inspect trench boxes for good condition before each use.
2. Minimize the excavated area between the outside of the trench box and the face of the trench.
3. Backfill the space between the trench box and the excavation side to prevent lateral movement of the box.
4. Ensure the trench box is extending at least 18 inches above the surrounding area if there is sloping toward the excavation. Providing a sloped area adjacent to the box.

5. Ensure the shields ride two feet above the bottom of the excavation provided they are calculated to support the full depth of the excavation and there is no caving under or behind the shield.
6. The manufacturer must approve any modifications to the shields.
7. Workers must enter and leave the shield in a protected manner, such as by a ladder.
8. Workers may not remain in the shield while it is being moved.

5. Protective Methods Using Other Tabulated Data.

Other tabulated data, such as tables and charts, may be selected for the design of sloping, benching, shoring or shielding systems. The tabulated data used must be written and include the following:

- Identification of the factors that affect the selection of a protective system;
- Identification of the limits of use of the data;
- Information needed by the user to make a correct selection of a protective system from the data; and
- At least one copy of the tabulated data, which identifies the Registered Professional Engineer who approved the data, will be maintained at the job site during construction of the protective system.

IV. Design by a Registered Professional Engineer.

A Registered Professional Engineer may design sloping, benching, shoring and shielding systems. The design will be written and must include the following:

- A plan indicating the sizes, types and configurations of the materials to be used in the protective system.
- The identity of the Registered Professional Engineer approving the design.
- At least one copy of the design must be maintained at the job site during construction of the protective system.

NOTE: A Registered Professional Engineer must approve all excavations more than 20 feet in depth.

Contractors Performing Excavation Operations

- I. Contractors hired by any agent of the University to perform excavation operations must have their own trenching safety policies that comply with federal and state OSHA/MOSH regulations.
- II. Contractors must coordinate with Facilities Management and EHS early in the programming and development stages to determine their project's impact to utilities.
- III. The contractor must obtain written approval from Facilities Management and EHS indicating that the impact to utilities has been reviewed and approved before bidding the work or proceeding with excavation.
- IV. The contractor must coordinate with Miss Utility and Facilities Management the identification and marking of underground utilities including sewer, telecommunication, gas, water, steam and electric. The contractor will arrange to have these utilities protected, removed or relocated as directed by Facilities Management and Miss Utility.

Emergency Rescue

- I. Emergency rescue equipment, such as breathing apparatus, a safety harness and line or a basket stretcher, will be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during working in an excavation. This equipment will be attended when in use.
- II. In the event of any emergency requiring rescue from an excavation, Towson University personnel will not attempt to enter an unprotected trench to perform rescue. Contact the University Police via your two way radio or dial 911. At the emergency blue-light and yellow phones located around campus, press the emergency button to be connected to the University Police who can contact 911 for you, or dial 911 on the key pad to be connected directly to the 911 Center. Give the dispatcher all of the requested information.
- III. Rescue services that can be performed safely from outside the excavation, such as hoisting a harnessed victim, will be undertaken until BCFD arrives. Other personnel in the excavation will exit immediately, providing assistance only when not endangering their own safety.
- IV. Baltimore County Fire Department (BCFD) will provide emergency rescue services for all trench emergencies on the TU campus. Local fire and rescue services will provide their own equipment and training in accordance with federal and state regulations.

APPENDIX A

OSHA EXCAVATING STANDARD 29 CFR 1926.650-652

Links:

1926.650:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10774

1926.651:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10775

1926.652:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10776

APPENDIX B

COMAR 20.85.05

“PROTECTION OF UNDERGROUND ELECTRIC & COMMUNICATION FACILITIES DURING EXCAVATION”

Links:

<http://www.dsd.state.md.us/comar/20/20.85.05.01.htm>

<http://www.dsd.state.md.us/comar/20/20.85.05.02.htm>

<http://www.dsd.state.md.us/comar/20/20.85.05.03.htm>

<http://www.dsd.state.md.us/comar/20/20.85.05.04.htm>

<http://www.dsd.state.md.us/comar/20/20.85.05.05.htm>

<http://www.dsd.state.md.us/comar/20/20.85.05.06.htm>

APPENDIX C

BOCA NATIONAL BUILDING CODE CHAPTER 33 SECTION 3304

(Note: This section not available online.)

APPENDIX D

MARYLAND UNDERGROUND UTILITY
DAMAGE PREVENTION ACT

Link:

http://mlis.state.md.us/cgi-win/web_statutes.exe?gpu&12-101