

TRENCHING
AND
SHORING
PLAN

Review and Approval Authority

Prepared and Edited by:

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Date

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Director - Dept. Of Environmental Safety

Date

Chair - UM E, H & S Operations Committee

Date

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Approved as University of Maryland Policy:

President

Date

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Emergency and Assistance Telephone Numbers

FIRE - POLICE - RESCUE - EMERGENCY MEDICAL SERVICE -

9-1-1

CALL IMMEDIATELY FOR ANY EMERGENCY INCLUDING CONFINED SPACE INCIDENT, CHEMICAL SPILL, FIRE, INJURED, TRAPPED OR SICK PERSON

Dept. of Environmental Safety (Main Office) (Industrial Hygiene, Occupational Safety, Environmental Affairs, Fire Safety, Radiation Safety, Insurance Services, Accident Investigation, and Safety Education)	(301) 405-3960
University Health Center - Occupational Health (Medical Consultation and Evaluation)	(301) 314-8172
Dept. of Facilities Management - Utility Operations (Approval of all digging, trenching or excavation on UM campus)	(301) 405-7078
Dept. of Facilities Management - Work Control Center (For Confined Space permits)	(301) 405-2222
Dept. of Communication and Business Services (Marking of underground telecommunication lines)	(301) 405-4400
MISS UTILITY (Marking of all underground utilities in Maryland, Washington, D.C., Delaware, and Northern Virginia)	(800) 257-7777

Policy Statement

A. 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", and with the BOCA National Building Code Chapter 33 Section 3304.

B. Scope

The Trenching & Shoring Plan shall apply to all faculty, staff and students who are involved in excavation operations on property owned and/or operated by the University of Maryland and satellite locations and operations associated with the campus which are located in the State of Maryland. For sites outside of Maryland but in the United States of America or its territories, provisions of OSHA regulations 29 CFR 1926.650, .651 and .652 for "Excavation, Trenching and Shoring" shall apply, unless more stringent safety regulations for that jurisdiction are in effect. For sites outside of the United States of America or its territories, local provisions shall apply as long as they offer worker protection equivalent to aforementioned OSHA regulations. If local standards do not offer equivalent protection, then University personnel should follow OSHA provisions.

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

C. 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.

D. Duties and Responsibilities

1. Department of Environmental Safety (DES) shall:

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

2. Department Heads shall:

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

3. Designated Supervisors shall:

- a). Implement all provisions of the *Trenching and Shoring Plan* for work areas under their control;
- b). Receive training for “Competent Person” for trenching as defined by OSHA.
- c). Act as the “Competent Person” for excavation sites under their control;
- d). Assure that the equipment necessary to complete an excavation safely is available and in good condition;
- e). Assure that all underground utility installations such as sewer, telephone, fuel tanks, electric, gas, and water lines are located and marked before excavation begins;
- f). Receive written approval from the Department of Facilities Management - Utility Operations for digging, trenching or excavation on the UM campus.
- g). Conduct soil tests to determine soil type;
- h). Ensure that underground installations are protected, supported or removed while the excavation is open. Notify Utility Operations when utility systems are exposed during the excavation process to allow the location and condition of the utility to be evaluated;

- i). Ensure worker protection and compliance with other applicable safety plans, programs and guidelines;
- j). Ensure protection of the public with appropriate barricades;
- k). Determine what protective systems will be used to prevent cave-ins;
- l). 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,
- m). Immediately notify Work Control in the event a utility system is damaged during the excavation process on the UM campus.

4. The Department of Facilities Management shall:

- a.) Review project concepts and designs for potential impact to utility systems on University of Maryland 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;
- b). Coordinate the marking of underground utilities on UM campus;
- c). Provide for the marking of underground utilities under its authority;
- d). Notify Washington Gas in the event of a broken gas line;
- e). Inspect utility systems exposed during the excavation process;
- f). 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,
- g). Interface with contractors under its control to monitor compliance with this OSHA/MOSH regulations;

5. The Department of Communications and Business Services shall:

- a). Provide for the identification and marking of underground telecommunications lines.

6. Employees shall:

- a). Complete all safety training requirements and request further instruction if unclear on any part of the *Trenching and Shoring Plan*;
- b). Use appropriate safety and personal protective equipment (PPE);
- c). Adhere to the requirements of the *Trenching and Shoring Plan*; and,

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- d). Report all work place injuries and unsafe conditions.

E. Information

Assistance will be provided by DES to any Department or individual requesting guidance or training to satisfy implementation of this policy.

Call DES at (301)405-3960; Send electronic mail to Safety@umd.edu; or,
View the DES home page at <http://www.des.umd.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 shall be trained in the requirements of this plan. Training shall be performed before anyone is assigned duties in excavations. Call Environmental Safety at (301)405-3960 for assistance in training arrangements.

A. **Training of the Designated Supervisor**

1. All Designated Supervisors of trenches and excavations shall meet the OSHA requirements for “a Competent Person”.
2. Designated Supervisors will attend “Competent Person” training conducted by a DES approved training source such as the Maryland Fire and Rescue Institute (MFRI) or MOSH.

B. **Training of Workers**

Personnel who perform work in excavations shall comply with the requirements of this plan and shall receive appropriate training that shall include 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 DES indicate that a worker does not have the necessary knowledge or skills to safely work in or around excavations.

Training records will be maintained by the Designated Supervisor and DES.

Excavation Procedures

A. **Project Development and Impact to Utilities.** The Designated Supervisor shall ensure that a campus project is coordinated with Facilities Management Utility Operations early in the programming and development stages, so that conflicts with utilities can be resolved early. The Designated Supervisor shall obtain written approval from Utility Operations indicating that the impact to utilities has been reviewed and approved prior to proceeding with excavation.

B. **Utilities and Pre-work Site Inspection.** The Designated Supervisor shall 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 shall be located and clearly marked. The Designated Supervisor shall arrange to have these utilities protected, removed or relocated as directed by Utility Operations and as may be needed to do the work safely. Excavation shall be done in a manner that does not endanger the underground installations or those engaged in the work. Utilities left in place shall be protected by barricades, shoring, suspension or other means as necessary.

For sites in the State of Maryland, Washington D.C., Delaware and Northern Virginia, MISS UTILITY shall be notified to arrange for the marking of underground utilities. For sites in other areas of the United States and other parts of the world, the local procedures for marking utilities before excavation shall apply.

C. **Stability of Adjacent Structures.** The Designated Supervisor shall 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 shall ensure that the recommendations of the engineer are carried out. Plans that outline the design of such precautions approved by the engineer shall be maintained on site while the work is in progress.

D. **Protection of the Public.** Barricades, walkways, lighting and signs shall be provided for the protection of the public prior to the start of excavation operations. Guardrails, fences, or barricades shall be provided adjacent to walkways, driveways and other pedestrian or vehicle thoroughfares.

E. **Protection of Workers in Excavations.** The Designated Supervisor shall assure that workers are protected from hazards that may arise during excavation work.

1. Stairs, ladders or ramps shall be provided when workers enter excavations over 4 feet deep. Two or more means of exit shall be provided if the excavation is more than 20 feet in length. A means of exit shall be provided every 25 feet of trench length.

2. Those workers exposed to vehicular traffic shall wear warning vests made of high visibility material.
3. No one shall work underneath loads handled by lifting or digging equipment. Workers shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
4. A warning system shall 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.
5. Materials and equipment should be kept at least 2 feet from the edge of the excavation with the proper protective system in place.

F. **Hazardous Atmospheres and Confined Spaces.** Workers shall not be permitted to work in hazardous and/or toxic atmospheres. Such atmospheres include those with the following:

1. Atmospheric oxygen concentration below 19.5% or above 23.5%.
2. A combustible gas concentration greater than 10% of the lower flammable limit.
3. 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 shall ensure that atmospheric testing is conducted prior to worker entry and continuously during work. Excavations near underground storage tanks or that contain gas pipelines should be monitored. Suitable precautions shall be taken as necessary to protect workers. These precautions may include the following:

1. Engineering controls such as ventilation;
2. Respiratory protection; Those required to wear respiratory protection must be enrolled in the *University of Maryland Respiratory Protection Program*. Enrollment in the program requires workers to:
 - a). Complete respiratory protection training; Training for air purifying respirators is provided by DES and for SCBA/SAR by the MFRI.
 - b). Obtain a fit test provided by DES;

- c). Complete a medical examination provided by the University Health Center; and
 - d). Maintain annual re-certification.
3. Full body harnesses and lifelines.

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

- 1. Contains or has the potential to contain a hazardous atmosphere, OR
- 2. Contains a material that has the potential for entrapping, engulfing or suffocating an entrant, OR
- 3. 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
- 4. Contains any other recognized serious or health hazard.

G. Personal Protective Equipment (PPE). The Designated Supervisor shall ensure that all workers wear all required safety equipment as detailed below. Hardhats, safety eye ware, gloves, hearing protection and fall protection devices shall be furnished by 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).

- 1. Everyone working in trenches or excavations shall wear ANSI approved hardhats at all times.
- 2. Everyone working in trenches or excavations shall wear ANSI approved steel toed shoes or boots.
- 3. Those exposed to flying fragments, dust or other materials produced by drilling, sawing, sanding, grinding and similar operations shall wear safety glasses with side shields.
- 4. Those exposed to hazards produced by welding, cutting, or brazing shall wear approved eye protection or a welding face shield or helmet. The Designated Supervisor shall obtain a Hot Work Permit from the Department of Environmental Safety. Call (301)405-3960 for information.

5. Those workers entering deep and confined excavations shall wear a harness with a lifeline securely attached to it. The lifeline shall be separate from any line used to handle materials. The lifeline shall be attended by a person at all times while the employee wearing the lifeline is in the excavation.
6. All workers shall wear gloves or other suitable hand protection as determined by the supervisor.
7. Workers at the edge of an excavation 6 feet or more deep shall be protected from falling by guardrails systems, fences, barricades, or other approved means.

A Workplace Hazard Assessment should be conducted by the supervisor or other qualified person according to the requirements described in the *University of Maryland Personal Protective Equipment Program*.

- H. **Walkways and Guardrails.** Walkways shall be provided where workers or equipment are allowed to cross over excavations. Guardrails shall be provided on walkways used by the general public regardless of the height above the excavation. Guardrails shall be provided on walkways used only by on-site personnel if the walkway is 4 feet or more above lower levels. If workers pass below a walkway, then guardrails and toeboards shall be provided.
- I. **Hazards Associated with Water Accumulation.** No one shall work in excavations with standing water or where water is collecting unless prior approval or instruction is given by the Designated Supervisor. Methods for controlling water accumulation must be provided and should 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 shall work in excavations during a rainstorm unless circumstances warrant it and adequate precautions are taken.
 5. Trenches shall be inspected by the Designated Supervisor after each rain and before anyone is permitted to re-enter the excavation.

J. Protection of Workers from Falling Objects: The Designated Supervisor shall ensure that workers are protected from loose rock or soil that could fall or roll from an excavation face. Such protection shall 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 may be used instead of barricades when practical.

Workers shall be protected from excavated materials, equipment or other objects that could pose a hazard by falling or rolling into excavation. These materials or equipment should be kept at least 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.

K. Inspections. The Designated Supervisor shall 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 should be conducted prior to the start of work and as needed throughout the shift. Inspections should also be made after every rainstorm. These inspections are only required when the trench will be or is occupied. When a hazardous condition is found, exposed workers shall be removed from the area until precautions have been taken to assure their safety.

Requirements for Protective Systems

A. **Protection of Workers in Excavations.** Personnel working in an excavation shall 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 4 feet in depth where examination of the ground by the Designated Supervisor provides no indication of a potential cave-in.

B. **Soil Classification.** In order to design the most appropriate protective system, the Designated Supervisor shall 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 - The entire excavation site including the soil adjacent to the site is observed. During the visual test, the Designated Supervisor shall 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
 - a). 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.
 - b). 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).
 - c). 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.

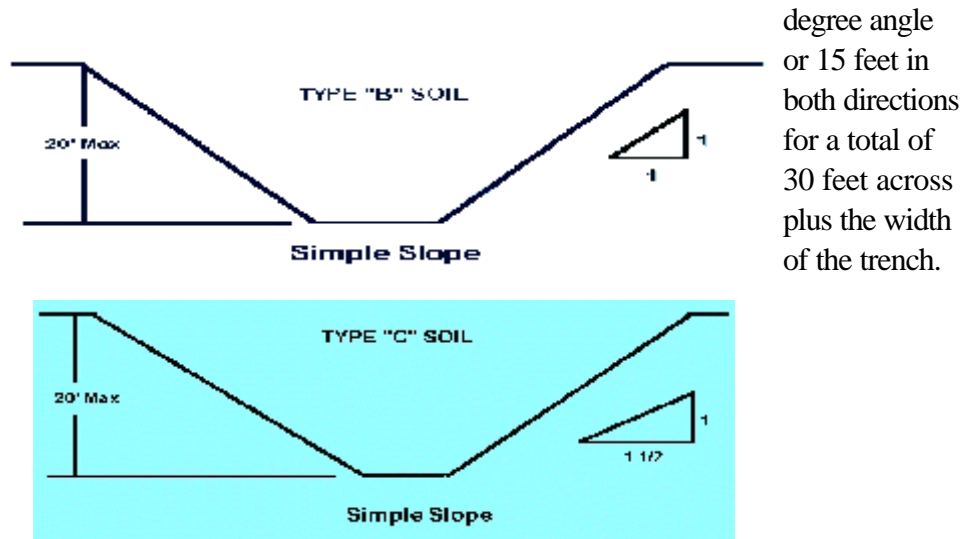
A pocket penetrometer, shearvane, or torvane may also be used to determine the unconfined compression strength of soils.

C. Types of Protective Systems. The following systems may be used to protect workers from cave-ins in trenches of more than 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	45E
Type C	1½:1	34E

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:

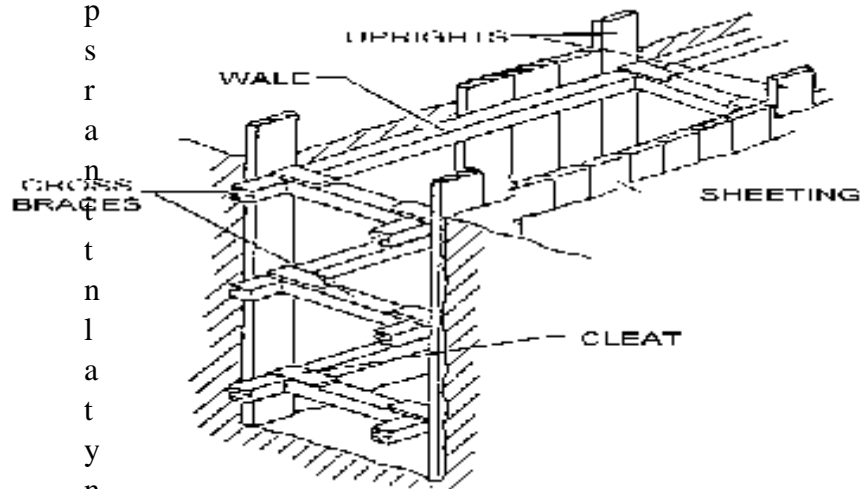
- a). Single. One level or step, not exceeding 4 feet in height.
- b). Multiple. More than one level or step, each not to exceed four feet in height.

Benching can be used in conjunction with simple sloping. Benches must be below the maximum allowable slope for that soil type. 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.
 - a). Timber. The Designated Supervisor should use the information in the tables of 29 CFR 1926 Subpart P Appendix C - Timber Shoring for Trenches (see DES web site at <http://www.des.umd.edu>). Use the chart for oak timber. 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 shall select the size and spacing of members using the appropriate table. The selection is 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.

- b). 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



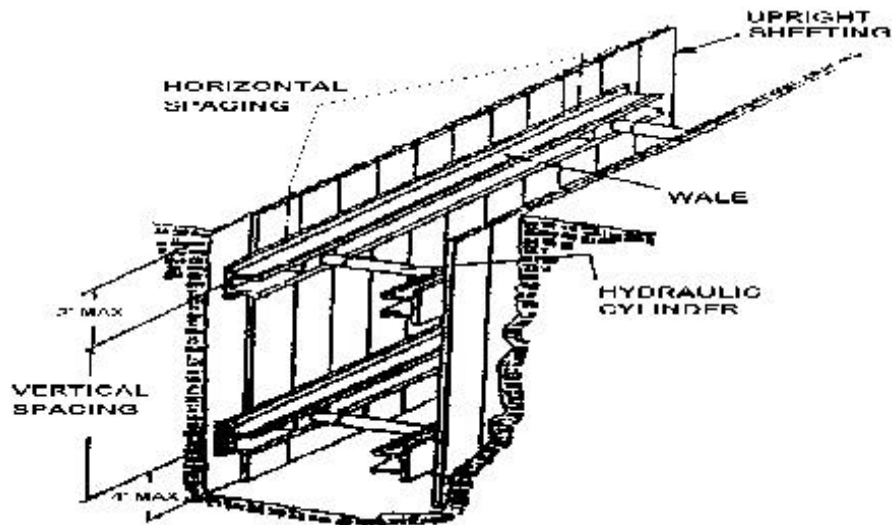
pted easily to various trench depths and widths.

Hydraulic Shoring Support Systems shall be constructed and used in accordance with all specifications, recommendations and limitations issued by the manufacturer.

Hydraulic shores must be installed in accordance with the 1926 Subpart P Appendix D - Aluminum Hydraulic Shoring for Trenches (see DES web site @ <http://www.des.umd.edu/>). The

Designated Supervisor should 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 shall be installed from the top down and removed from the bottom up. Hydraulic shoring shall be checked at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts. The top cylinder of hydraulic shoring shall 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 shall ensure that the following safety measures are taken:
 - a). Trench boxes shall be inspected for good condition before each use.
 - b). The excavated area between the outside of the trench box and the face of the trench should be minimized. The space between the trench box and the excavation side must be backfilled to prevent lateral movement of the box.
 - c). The trench box must extend at least 18 inches above the surrounding area if there is sloping toward the excavation. This can be accomplished by providing a sloped area adjacent to the box.
 - d). Shields may 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.
 - e). Any modifications to the shields must be approved by the manufacturer.
 - f). Workers must enter and leave the shield in a protected manner, such as by a ladder. 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:
 - a). Identification of the factors that affect the selection of a protective system;
 - b). Identification of the limits of use of the data;
 - c). Information needed by the user to make a correct selection of a protective system from the data; and
 - d). At least one copy of the tabulated data which identifies the Registered Professional Engineer who approved the data shall be maintained at the job site during construction of the protective system.
6. Design by a Registered Professional Engineer. Sloping, benching, shoring and shielding systems may be designed by a Registered Professional Engineer. The design shall be written and shall include the following:

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- a). A plan indicating the sizes, types, and configurations of the materials to be used in the protective system.
 - b). The identity of the Registered Professional Engineer approving the design.

At least one copy of the design shall be maintained at the job site during construction of the protective system.

NOTE: All excavations more than 20 feet in depth must be approved by a Registered Professional Engineer.

Contractors Performing Excavation Operations

Contractors who are hired by any agent of the University to perform excavation operations must have their own trenching safety policies that are in compliance with federal and state OSHA/MOSH regulations.

Contractors are expected to coordinate with Facilities Management early in the programming and development stages to determine their project's impact to utilities.

The contractor shall obtain written approval from Utility Operations indicating that the impact to utilities has been reviewed and approved prior to bidding the work or proceeding with excavation.

The contractor shall coordinate with Facilities Management the identification and marking of underground utilities including sewer, telecommunication, gas, water, steam and electric. The contractor shall arrange to have these utilities protected, removed, or relocated as directed by Utility Operations.

Emergency Rescue

In the event of any emergency situation requiring rescue from an excavation, University of Maryland personnel **shall not** attempt to enter an unprotected trench to perform rescue. When on the College Park campus, University Police shall be notified of all emergencies by calling 9-1-1 on any campus or pay phone, by using a PERT phone, or by calling for help via radio. In other areas in the State of Maryland, the local emergency services shall be notified by calling 9-1-1. In all other areas of the United and States and around the world, the local emergency services shall be notified using the standard reporting system for that area.

Rescue services that can be performed safely from outside the excavation, such as hoisting a harnessed victim, shall be undertaken. Other personnel in the excavation shall exit immediately, providing assistance only when not endangering their own safety.

Emergency rescue services will be provided for all trench emergencies on the College Park campus by Prince George's County Fire Department and fire departments in other jurisdictions as needed for mutual aid. The appropriate local fire department will provide rescue services in all other areas of the state. Local fire and rescue services will provide their own equipment and training in accordance with federal and state regulations.