Excavation and Trenching Safety Program

Workers Manual

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Occupational Safety Programs

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PREFACE

Environmental Health and Safety Services (EHSS) developed this program to protect employees from safety hazards during work in trenches and excavations. This program will make sure that:

- Departments that work in trenches or excavations know how to do this work safely;
- Departments that work in trenches or excavations have named one or more people (their Project Manager(s)) to oversee this work for their department;
- The role of the Project Manager and workers are understood; and,
- People that work in excavations and trenches have been trained and know how to do their work safely.

This program explains the training that employees must have so that they can recognize and avoid hazards during excavation work. This program also explains the work practices they must follow while digging or working in or around an excavation.

The departmental Project Manager must assure that:

- Approved procedures are followed;
- Employees entering excavations are trained and have been given the equipment they need to do their jobs safely; and,
- All required inspections and tests have been done, and have been properly recorded.

The employee must:

- Follow established procedures
- Enter an excavation only after receiving training; and

Demonstrate a complete understanding of the safe work practices that are to followed while working in an excavation.1.0 **INTRODUCTION TO THE PROGRAM**

0The purpose of this program is to put in place work practices and procedures that will protect employees from excavation hazards. This is done by:

0Requiring each department that works in excavations to name one or more people to serve as their **Project Manager**;

1Training Project Managers so they understand their duties and their role;

2Requiring that all employees that work in excavations have been trained and are able to demonstrate a complete understanding of the safe work practices that are to followed while working in an excavation.

1This program was written to meet the Occupational Safety and Health Administration (OSHA) requirements for this type of work.

1.1 Who Should Participate

0All departments that work in or around excavations. The work done by a department will be overseen by their Project Manager.

1Workers who work in or around excavations;

2Contractor's personnel, since the work done by a Contractor can affect the safety of people working in or around excavations.

2.0 DEFINITIONS

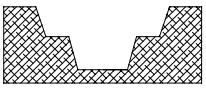
Figure 1.0 -- Benching System

Benching (Benching system) means an excavation where the sides are sloped up and then stepped as shown in Figure 1.0.

Cave-in means that soil or rock has fallen into an excavation, or soil has pushed under a trench shield or support system, in large enough amounts to trap or bury a person.

Competent person means a person trained to identify hazards at the worksite, or working conditions that are unsafe for employees. The **Project Manager** serves as the departments competent person for the purposes of this program. The Project Manager must do certain tests and inspect the worksite as required by this program, and must make sure that all employees are trained and are doing their work safely.

Cross braces mean the braces of a shoring system that extend from side-to-side in the excavation. The cross braces bear against either uprights or wales.

Department means a department at the university that works in excavations.

Excavation means any man-made cut or trench made by earth removal.

Faces or sides mean the sloped sides of an excavation. In some types of soil or rock the sides can be vertical or almost vertical.

Failure means that a part of a brace or shoring system has moved or been damaged and can no longer support the sides of the excavation.

Hazardous atmosphere generally means that something is present in the air that could harm employees, or that there is too much or not enough oxygen present. A hazardous atmosphere is an atmosphere that is explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, that may cause death, illness, or injury.

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

Project Manager is the person in the department that will oversee excavation work and that will make sure that the department complies with this program.

Protective system is the means used to protect employees from cave-ins, from material falling into an excavation, or from the collapse of adjacent buildings, roads or other structures.

Safety Coordinator means the person at Environmental Health and Safety Services (EHSS) responsible for overseeing this program, making unannounced work site inspections, and who makes sure that departments comply with this program.

Sheeting means the parts of a shoring system that hold the earth in place. Sheeting is held in place by other parts of the shoring system.

Shield means a device used in an excavation to prevent cave-ins and protect employees working inside the shield system. Shields may be built by workers in the excavation, or may be portable units moved along as work progresses. Shields used in trenches are usually called "**trench boxes**" or "**trench shields**."

Shoring means a structure built or put in place to support the sides of an excavation to prevent cave-ins.

Sloping means sloping the sides of the excavation away from the excavation to protect employees from cave-ins. The slope will vary with type of soil, weather, and other conditions.

Support system means underpinning, bracing, or shoring used to support an adjacent building, underground utilities, or the sides of an excavation.

Uprights are the vertical parts of a shoring system placed against the sides of the excavation.

Wales are the parts of a shoring system placed in the long direction of the excavation that bear against the uprights or sheeting.

3.0 PROGRAM ELEMENTS

3.1 Training and Duties of Program Participants

0All people that work in excavations shall be trained in what is required by this program. The departmental Project Manager will train their employees with assistance as needed from the Safety Coordinator at EHSS.

1Employees will be trained **before** they begin work in excavations.

2Employees will be retrained annually, when work procedures change, or if it appears that work is being done unsafely.

3.2 Training and Duties of Workers

All workers in excavations shall comply with this program. These workers shall receive training in:

0Safe work practices to be followed when working in excavations;

1The use of personal protective equipment required during work in excavations, such as safety shoes and hardhats (see Section 4.3(F));

2Safe work practices to be followed if a hazardous atmosphere is present in an excavation; and,

3Emergency rescue methods, and procedure for calling rescue services.

3.3 Training and Duties of the Project Manager

The Project Manager shall receive the training detailed above. The Project Manager shall also receive training on selecting the methods used to protect workers in an excavation (Section 4.0 and 5.0 of Virginia Tech's

Excavation and Trenching Safety Program for Project Managers). The Project Manager shall:

A. Help schedule and train departmental employees;

B. Inspect the worksite daily, or more often as needed to make sure that work site conditions are safe for employees to work in excavations;

C. Determine the means of protection to be used for each excavation project (see Section 4.3(A) to 4.3(E)); and,

D. Assure that only approved protective systems and designs are used.

3.4 **Safety Coordinator**

0The Excavation and Trenching Safety Program is managed by the Safety Coordinator at Environmental Health and Safety Services (EHSS). The Safety Coordinator will:

0Make sure that the program is keeping employees safe, and that the departments are doing excavation work in a safe manner ;

1Help departments select equipment that will protect workers;

2Train Project Managers, and help the Project Managers train other departmental employees;

3Review and update the program as needed.

4.0 **SPECIFIC EXCAVATION REQUIREMENTS**

4.1 **Utilities and Pre-work Site Inspection:** The Project Manager shall inspect the site before the excavation is started. Special safety measures shall be taken as directed by the Project Manager.

Underground sewer, telephone, gas, water and electric lines shall be located and clearly marked. The Project Manager shall arrange to have these utilities protected, removed or relocated as needed to do the work safely. The excavation work shall not be allowed to endanger the underground utility or the people doing the work. Utilities left in place that are exposed by the excavation shall be protected by barricades, shoring, or other supports as needed.

Trees, brush, boulders or other objects at the surface that could harm employees working in the excavation shall be removed or supported.

4.2 **Protection of the Public:** The Project Manager shall assure that barricades, walkways, lighting and signs are used as needed to protect the public during excavation work.

Guardrails, fences, or barricades shall be used at excavations next to walkways or driveways used by pedestrians or vehicles. Warning lights and area lighting shall be used from sunset to sunrise as needed to protect the public and employees.

Wells, holes, pits, shafts and similar excavations shall be barricaded or covered and posted as needed to prevent unauthorized access. All temporary excavations of this type shall be backfilled as soon as possible.

Walkways or bridges with guardrails shall be used where the general public is permitted to cross over excavations.

4.3 **Protection of Workers in Excavations.** The Project Manager shall assure that employees are protected from hazards that may arise during excavation work as required by Section 4.3(A) to 4.3(J).

Means of entry and exit from the excavation. Stairs, ladders or ramps shall be provided when employees enter excavations over 4 feet deep. The distance of travel in the trench to reach the stair, ladder or ramp must be less than 25 feet. Two or more means of exit shall be provided if the excavation is more than 20 feet deep.

Exposure to vehicular traffic. Employees exposed to vehicular traffic shall be given, and shall wear, warning vests or other suitable garments. These shall be marked with or made of high-visibility material. Warning vests worn by flagmen shall be red or orange, and shall be of reflectorized material if worn during night work.

Employee exposure to falling loads. No employee shall work underneath loads handled by lifting or digging equipment. Employees shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded if the vehicles provide protection for the operator during loading and unloading operations.

Warning system for mobile equipment. A warning system (such as barricades, hand signals, or stop logs) 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. If possible, the grade should be away from the excavation.

Hazardous atmospheres. The Project Manager will test the atmosphere in excavations over 4 feet deep if a hazardous atmosphere is present or could develop. A hazardous atmosphere could develop, for example, in excavations in landfill areas, if hazardous materials are stored nearby, or in excavations near or containing gas pipelines. Suitable precautions will be taken by the Project Manager as necessary to protect employees.

Personal protective equipment (PPE). The Project Manager shall ensure that all employees wear all required safety-related equipment as detailed in the following sections. Hardhats, safety eyewear, gloves, hearing protection, and fall protective devices shall be furnished by the Department. The Department may elect to furnish safety footwear, but shall, at a minimum, ensure that all employees conducting work in excavations are wearing approved safety footwear. PPE shall be inspected regularly by the employee for signs of wear or damage; damaged PPE shall be immediately repaired using approved parts or replaced.

All employees working in trenches or excavations shall wear approved hardhats at all times.

All employees working in trenches or excavations shall wear approved steel toed shoes or boots.

Employees exposed to flying fragments, dust, or other materials produced by drilling, sawing, sanding, grinding and similar operations shall wear, at a minimum, safety glasses with side shields.

Employees exposed to hazards produced by welding, cutting, or brazing shall wear approved spectacles or a welding faceshield or helmet as determined by the Project Manager.

Employees entering deep and confined footing 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.

Employees shall wear approved gloves or other suitable hand protection as determined by the Project Manager.

Employees at the edge of an excavation 6 feet or more deep shall be protected from falling by guardrail systems, fences, barricades, or other approved means.

Walkways and guardrails. Walkways shall be provided where employees 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 project personnel if the walkway is 4 feet or more above lower levels. If employees pass below a walkway, then guardrails and toeboards shall be provided.

Protection from hazards associated with water accumulation: Employees shall not work in excavations with standing water or where water is collecting unless prior approval or instruction is given by the Project Manager.

Stability of adjacent structures. The Project Manager will take precautions as needed to protect employees, nearby buildings or other structures. The precautions taken, such as shoring, bracing, or underpinning, will be constructed as directed by the Project Manager.

Protection of employees from falling objects and loose rocks or soil.

The Project Manager will assure that employees are protected from loose rock or soil that could fall or roll from an excavation face. Such protection shall consist of:

Scaling to remove loose material;

Installation of barricades such as wire mesh or timber as needed to stop and contain falling material; or

Benching. Benching may be used, when practical, instead of barricades.

Employees shall not to work above one another in an excavation where the danger of falling rock or earth exists.

Employees shall be protected from excavated materials, equipment or other materials that could pose a hazard by falling or rolling into an excavation. Employees shall take care that all materials or equipment are kept at least 2 feet from the edge of the excavation.

The Project Manager may require that restraining devices be used to prevent materials or equipment from falling or rolling into the excavation.

The Project Manager may require that materials and equipment need to be stored further than 2 feet from the edge of the excavation.

Employees shall take care to ensure that materials piled, grouped or stacked near the edge of an excavation are stable and self-supporting.

4.4 **Inspection by the Project Manager.** The Project Manager will inspect the excavation, work area around the excavation, and the protective systems used at least daily. This inspection shall be conducted by the Project Manager prior to the start of work and as needed throughout the shift. The Project Manager shall also inspect after every rainstorm or when other conditions occur that could increase the hazard to employees. These inspections are only required when the trench will be or is occupied by employees.

5.0 **REQUIREMENTS FOR PROTECTIVE SYSTEMS**.

5.1 **Protection of Employees In Excavations**. Employees in an excavation shall be protected from cave-ins by:

- Sloping or sloping and benching the sides of the excavation;
- Use of trench shields; or
- Construction of trench supports.

The type of protection used shall be determined by the Project Manager. These protections are not required if:

- Excavations are made entirely in stable rock (as determined by the Project Manager); or
- Excavations are less than 5 feet deep, and the Project Manager has looked at the excavation and found no sign of a potential cave-in.

Special caution shall be used when excavating next to any excavation backfilled earlier or next to any fill material.

5.2 **Materials and Equipment**.

The Project Manager shall ensure that materials and equipment used to protect employees from cave-ins shall be free from damage or defects.

Manufactured trench shields, trench boxes and other materials and equipment used for support systems shall be used and maintained in accordance with the manufacturer's recommendations.

If materials or equipment used for support systems are damaged, they shall be removed from service until reapproved for use by the Project Manager.

5.3 **Installation and Removal of Support.**

General.

Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other potential hazards.

Support systems shall be installed and removed as directed by the Project Manager.

Before any part of the support system is removed, additional precautions shall be taken as directed by the Project Manager.

Removal of support systems shall begin at the bottom of the excavation. Support members shall be released slowly. If there is any sign of possible failure of other members of the structure, or possible cave-in of the sides of the excavation, the work shall be stopped. The work shall not resume until it has been examined by the Project Manager.

The excavation shall be backfilled as the support system is removed.

Additional requirements for support systems for trench excavations.

The Project Manager may allow up to 2 feet of soil to be removed from below the bottom of the support system. This work shall be halted if there is any loss of soil from behind or below the bottom of the support system.

The installation of a support system, if used, shall closely follow the excavation of the trench.

5.4 **Shield Systems.**

Shields shall be installed in such a way that the shield will not move if there is any sudden soil movement against the shield.

Employees entering or exiting the areas protected by shields shall be protected from the hazard of cave-ins. Employees shall not walk in an unprotected section of an excavation to reach the shield.

Employees shall not be allowed in shields when shields are being installed, removed, or moved.

Additional requirement for shield systems used in trench excavations. The Project Manager may allow up to 2 feet of soil to be removed from below the bottom of the support system. This work shall be halted if there is any loss of soil from behind or below the bottom of the support system.