

EXCAVATIONS - EXPOSURE CONTROL PLAN (7/1/2010) (Rev. 8/17/2015)

The Language Used In This Document Does Not Create An Employment Contract Between The Employee And The Agency. This Document Does Not Create Any Contractual Rights Or Entitlements. The Agency Reserves The Right To Revise The Content Of This Document, In Whole Or In Part. No Promises Or Assurances, Whether Written Or Oral, Which Are Contrary To Or Inconsistent With The Terms Of This Paragraph Create Any Contract Of Employment.

Every year in the US there are an estimated 150 deaths and more than 1,000 lost work days per year from trenching accidents involving hazards to cave-ins, contact with numerous underground utilities, hazardous atmospheres, water accumulation and collapse of adjacent structures. This policy provides procedures for our occasional excavation workers in order to prevent such trenching accidents. Excavating is a task that is not often undertaken by the Department of Administration employees such as in the Facilities Management Section, and can be an extremely hazardous duty, no matter the size of the excavation, if not properly safeguarded.

Office of Prime Responsibility

The Department of Administration Safety Office is responsible for developing and maintaining this written Excavation Plan which is made available through the Department of Administration Safety Office website.

Applicable Standard: Title 29 of the Code of Federal Regulations, Part 1926 Construction, Sub-Part P – Excavations, Standard .650 through .652 with Appendices A through F.

[1926.650 - Scope, application, and definitions applicable to this subpart.](#)

[1926.651 - Specific Excavation Requirements.](#)

[1926.652 - Requirements for protective systems.](#)

[1926 Subpart P App A - Soil Classification](#)

[1926 Subpart P App B - Sloping and Benching](#)

[1926 Subpart P App C - Timber Shoring for Trenches](#)

[1926 Subpart P App D - Aluminum Hydraulic Shoring for Trenches](#)

[1926 Subpart P App E - Alternatives to Timber Shoring](#)

[1926 Subpart P App F - Selection of Protective Systems](#)

Definitions

BENCHING refers to a stepped form of sloping where the sides of an excavation are formed by a series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.

COHESION refers to how well soil holds together.

COMPETENT PERSON refers to a person qualified through training and knowledge of the following, especially pertaining to excavations, and who has authorization to take prompt corrective measures to eliminate hazards to employees.

1. OSHA Standards
 - a. Excavations
 - b. Fall Protection
 - c. Confined Space Entry
 - d. Personal Protection Equipment
 - e. Ladders
 - f. Lockout-Tagout
 - g. And other standards, as applicable
2. Hazard Identification
3. Locating Underground Utilities
4. Evaluating Soil Conditions
5. Constructing Protective Systems
6. Determining Needed Safety Equipment
7. Providing Safe Access & Emergency Egress
8. Site Inspection

EXCAVATION refers to a man-made cut, cavity, trench, or depression formed by earth removal.

FISSURED refers to soil that can be seen to have a narrow opening or crack of considerable length and depth usually occurring from some breaking or parting.

FRACTURED refers to rock that is cracked and separating.

GRAIN SIZE is used to classify soil stability; the bigger the grain, the less stable the soil.

- Gravel is larger than pencil lead
- Sand is smaller than gravel but larger than silt or clay
- Silt or Clay is microscopic

LAYERED refers to an excavation through two or more types of soil where the overall classification is based on the weakest soil.

PROTECTIVE SYSTEM refers to a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or 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.

1. If the excavation is entirely in stable rock, no protective system is needed.
2. If the excavation is five feet (5') or less deep, and examination of the ground by a competent person provides no indication of a potential cave-in, then no protective system is necessary or used.
3. If the excavation is twenty feet (20') or more deep, then a registered professional engineer shall design the protective system for use in the excavation.

SATURATION refers to the degree of water in the soil; if too wet or too dry the soil becomes unstable.

SHIELDING refers to a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as trench boxes or trench shields. Shields are typically used when there is not enough space for the excavation to be sloped.

SHORING refers to a structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed by a competent person to prevent cave-ins; used when there is not enough space for the excavation to be sloped.

SLOPING refers to a method of protecting employees from cave-ins by angling the sides of an excavation at an incline away from the excavation. The angle of incline required varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

SPOIL PILE refers to the soil removed from the excavation.

STABLE ROCK refers to natural solid mineral matter which can be excavated with vertical sides and remain intact while exposed.

TRENCH refers to a narrow excavation where the depth is greater than the width and the bottom not wider than 15 feet.

TYPE A SOIL has an unconfined compressive strength of 1.5 tons per square foot (tsf). Type A soils include clay, silty clay, sandy clay, clay loam, caliche, hardpan, and sometimes-silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; subject to vibration from traffic, pile driving, or similar effects; previously disturbed; or part of a sloped, layered system where the slope is four horizontal to one vertical or greater.

TYPE B SOIL has an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf. Type B soils include granular cohesionless soils like angular gravel, silt, silt loam, sandy loam, and sometimes silty clay loam and sandy clay loam; previously disturbed soils that are not Type

C; fissured soils and soils subject to vibration that would otherwise be classified as Type A; dry rock that is not stable; and material that is part of a sloped, layered (benched) system with a slope less steep than four horizontal to one vertical.

TYPE C SOIL has an unconfined compressive strength of 0.5 tsf or less. Type C soils include granular soils such as rounded gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered (benched) system with a slope of four horizontal to one vertical or steeper.



Type A Soil



Type B Soil



Type C Soil

UNCONFINED COMPRESSIVE STRENGTH refers to a soil's weight per square foot for wall shear, spall and collapse.

Policy

It is the policy at the SC Department of Administration to permit only trained and authorized personnel to create or work in excavations. Department of Administration excavation projects over two and a half feet (> 2.5') deep, approximately knee height, will be accomplished by an outside contracted organization, not by Department of Administration personnel. A work permit (see Attachment 4) must detail the foreseeable hazards and safety precautions to address those hazards for each excavation.

Excavation Procedures

Anyone excavating at a Department of Administration -owned or maintained facility must use the following procedures.

Competent Person

1. Currently there are no Department of Administration employees considered to be competent persons for purposes of excavations. Should such a person be deemed necessary "in house" then they should be designated using Attachment 1.
2. The Department of Administration may hire a competent person from a private or commercial source for purposes of planning and supervising the excavation, and/or a registered professional engineer to design a protective system for the planned excavation.

Before Excavating

Anyone excavating at a Department of Administration -owned or maintained facility must follow the steps below before excavation begins:

1. Contact the utility companies to find the exact location of the underground utility installations in the area. If the utility companies do not respond within 24 hours or if the underground utility lines cannot be located, the excavation may proceed with caution using detection equipment or other acceptable means to locate underground utilities to prevent their damage.
2. Remove or adequately support objects (such as trees, rocks and sidewalks) in the area of the excavation to prevent further hazard to employees.
3. A competent person qualified in excavations:
 - a. Must use at least one visual and at least one manual analysis to classify the type of soil and rock deposits at the site as either stable rock, Type A, Type B, or Type C soil (see Appendix A of 29 CFR 1926, Subpart P). NOTE: Soil classification is not necessary if the excavation will be sloped to an angle of one and one-half horizontal to one vertical or less steep.
 - b. Select the appropriate method for protective support systems.

Protective Support Systems

Employees in an excavation are to be protected from cave-ins by an adequate protective system designed by a competent person in accordance with OSHA standards. Protective system options include proper sloping or benching of the sides of the excavation; supporting the sides of the excavation with timber shoring or aluminum hydraulic shoring; or placing a shield between the side of the excavation and the work area.

1. No protective system is necessary if the excavation is:
 - a. Made entirely in stable rock.
 - b. 5 feet or less ($< 5'$) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.
2. Excavations over five feet ($> 5'$) deep shall be under the direction of a competent person qualified through training and knowledge in excavations.
3. If the excavation is less than 20 feet ($< 20'$) in depth, then a competent person chooses the most practical design approach (that meets required performance criteria) for the particular circumstance.
4. If the excavation is 20 feet or more ($> 20'$) in depth, then a registered professional engineer shall design the protective system.
5. Shoring:
 - a. Timber shoring may only be used in trenches 20 feet or less ($< 20'$) in length.
 - b. Aluminum Hydraulic Shoring:
 - i. Use the manufacturer's tabulated data (tables and charts) and design in accordance with the manufacturer's specifications, recommendations and limitations. Deviations from the manufacturer's specifications, recommendations and limitations are only allowed upon written approval of

the manufacturer, which must be obtained by the competent person prior to implementation. The tabulated data and written approval for deviation (copy) must be kept at the job site during construction of the protective system.

- ii. If the manufacturer does not have tabulated data or cannot be utilized,
 - 1) First determine the soil type then use the OSHA specifications found in Appendix D of 29 CFR 1926, Subpart P.
 - 2) Use other tabulated data approved by a professional registered engineer.
 - 3) Have a professional registered engineer design the protective system.
6. Shielding:
 - a. Use data provided by the manufacturer of the support system.
 - b. Use other tabulated data approved by an engineer.
 - c. Have a registered professional engineer design the system.
7. Any tabulated data used and written approvals for deviation must be provided to and kept on file with the Project Manager, i.e., GSD Facilities Management Section, Construction & Planning; or the Department of Administration Safety Office for at least one year after completion of the excavation.

General Requirements for Excavations

The following rules are to be followed at all times by all employees working on, in, or near an excavation, as applicable:

1. Employees in close vicinity to public vehicular traffic must wear warning vests or other suitable garments made of reflective or high-visibility material.
2. The competent person is to inspect the excavation and the adjacent areas on at least a daily basis for possible cave-ins, failure of protective systems and equipment, hazardous atmospheres, and any other hazardous conditions. More frequent inspections are also required after the occurrence of any natural events (such as rain) or man-made events (such as nearby pile-driving or blasting) that could increase the potential for collapse and other hazards. Employees may not begin work until after the competent person informs them that these inspections have been completed and it is safe to work.
3. A warning system (such as barricades) is used to alert heavy equipment operators and other employees at the work site that they are approaching the edge of the excavation.
4. Employees are to be adequately protected from falling rock, soil, or other materials and equipment by placing and keeping such materials or equipment at least 2 feet (> 2') from the edge of the excavation, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into the excavation, or by a combination of both, as necessary.
5. Employees are not permitted to work or walk under loads that are handled by lifting or digging equipment. Employees are not allowed to work in the excavation above other employees unless the lower level employees are adequately protected.
6. While the excavation is open, underground installations are to be protected (such as covers, barriers, lockout-tagout, etc.), supported, or removed as necessary to safeguard employees. Do not dig under adjacent structures unless they are supported by appropriate protective systems designed by a professional registered engineer to prevent potential collapse.

7. Employees are not permitted to work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken (such as using drainage pumps) and conditions are approved as safe by the competent person. Diversion ditches, dikes, and/or other means are to be used to prevent surface water from entering an excavation and to provide drainage away from the excavation and adjacent areas.
8. Before an employee enters an excavation greater than five feet (> 5') deep, the competent person will use the Confined Space Entry Permit or equivalent ([http://www.gs.sc.gov/webfiles/g_s_0/policy/CSE Permit Rev 3-19-09.pdf](http://www.gs.sc.gov/webfiles/g_s_0/policy/CSE_Permit_Rev_3-19-09.pdf)) to brief the selected work team and follow permit required confined space entry procedures to include:
 - a. Testing the atmosphere such as with an electronic multi-gas detector for oxygen deficiency or a hazardous atmosphere where reasonably expected to exist.
 - b. Using emergency rescue equipment (such as the confined space rescue tripod system with personnel winches and full body harnesses) when hazardous conditions exist or may develop.
 - c. Emergency Rescue: Have one Attendant top side per each Entrant in the excavation ready to call 9-1-1 and to perform an external extraction/rescue.
WARNING: No employee is to enter a collapsed excavation to effect rescue of a trapped Entrant or else they are subject to becoming victims themselves. Instead, call for Emergency Management Services (fire department excavation/trench rescue).
9. A means for exiting (such as straight ladders or ramps in) excavations four feet or more (> 4') deep shall be provided within twenty-five feet (25') of lateral travel for employees. These straight ladders shall extend at least three feet (> 3') above the top of the excavation.
10. Guardrails shall be provided if walkways or bridges cross over an excavation (trench).

Training

Team Leaders and supervisors will identify by name all employees whose job duties include excavation work. The Department of Administration Safety Office will provide Excavation Safety Awareness information and will instruct and/or obtain experienced employees designated and trained to instruct excavation hazard awareness training to all employees involved in excavation work. Contractors are responsible to train and equip their own employees.

Excavation Safety Awareness training shall include the recognition and avoidance of unsafe conditions and the regulations applicable to excavation work in order to control or eliminate any hazards or other exposure to illness or injury. Unsafe conditions include but are not limited to the following:

1. Cave-ins from:
 - a. Soil conditions
 - b. Machinery or vehicles operating nearby
2. Falling objects from:
 - a. Spoil pile
 - b. Stored supplies and equipment
3. Underground utility (gas, water, electrical, telephone) lines that may be accidentally cut resulting in:
 - a. Asphyxiation (lack of oxygen)

- b. Drowning
- c. Electrocution
- d. Inhaled toxic materials

This training may be provided by an instructor in a classroom or through computer based (i.e., on-line web-based) training, and may also include practical hands-on instructor-led and/or on-the-job training. This training may also be out sourced. Recurring training for designated employees shall be accomplished at least every three (3) years. Remedial training will be required any time their supervisor, the competent person or Department of Administration Safety determines the employee demonstrates a lack of knowledge or deficient performance. This training will be documented by Department of Administration Safety in the learning management system, *the Learning Board*.

This plan and informational training material will be available to employees through the Department of Administration Safety web page, under Policies and Programs - http://www.gs.sc.gov/webfiles/g_s_0/policy/BCB_Excavations_Apr2010.pdf .

Under no circumstances shall a Department of Administration employee create or work in an excavation until he/she has successfully completed the Department of Administration excavation training program. This includes all new excavation workers regardless of claimed previous experience. All Trades Specialists in GSD Facilities Management are to have this training.

Attachment 2 is to list employees who have been trained and are authorized to work at/in a specific excavation site where the excavation is more than two and one-half feet (> 2.5') deep.

Inspection Procedures

The assigned competent person is to inspect the excavations site at least daily and more frequently during poor weather, as required. See Attachment 3 for an excavation daily checklist.

Personal Protective Equipment

Department of Administration employees are required to wear personal protective equipment (PPE) when exposed to hazards in and around an excavation site (see PPE policy). All excavation workers are required to know when PPE is necessary; what PPE is appropriate (i.e., proper selection); how to don and doff the selected PPE; limitations of the PPE; and proper care, maintenance, useful life, and disposal of damaged PPE.

PPE for any excavation site includes but is not limited to hard hats, work gloves, safety eye protection, and safety footwear with toe crush protection and soles with protection against sharp object penetration. Other PPE may be appropriate, such as hearing protection, and as required by the competent person.

Bystander Protection

To protect passers by, the area around the excavation must have:

1. Physical barriers such as high visibility safety cones, barricades and/or warning tape along all approaches at least six feet (> 6') from the perimeter edge.
2. Warning signs strategically placed around the perimeter and visible to the naked eye from someone approaching at least 20 feet away. Examples:



3. When the excavation is unattended, it must also have a sturdy cover and/or secured fencing (chain link recommended; not mesh).

ATTACHMENT 1 – Department of Administration Competent Persons for Excavations

The following employees are considered Competent Persons for purposes of excavations:

First Name	Last Name	Section	Team	Telephone No.

ATTACHMENT 2 – Employees Authorized for Excavation Work

First Name	Last Name	Section	Team

ATTACHMENT 3 - Excavation Daily Checklist

Employee/Personal Protection/Trench Integrity

_____ Are employees protected from loose material that could fall into the trench?
29 CFR 1926.651(j)(2)

_____ Are walkways provided when employees or equipment are required to cross over excavations? 29 CFR 1926.651(l)(1)

_____ Are walkways that are six feet or more above lower levels of excavations equipped with guardrails? 29 CFR 1926.651(l)(1)

_____ Are employees provided with and are they required to wear proper safety equipment? 29 CFR 1926.28(a)

_____ If a hazardous atmosphere is identified, is ventilation provided or is respiratory protection in use? 29 CFR 1926.651(g)(1)(ii)

_____ Have hazardous objects been removed from the excavation area or blocked securely? 29 CFR 1926.651(a)

_____ Is heavy equipment mounted on wooden mats to distribute weight?
29 CFR 1926.651(a)

_____ Are damaged materials or equipment removed from service?
29 CFR 1926.652(d)(3)

_____ Is excavated material stored at least 2 feet from the edge of the excavation?
29 CFR 1926.651(j)(2)

_____ Has the soil type been classified?
29 CFR 1926.652 and 29 CFR 1926, Subpart P, Appendix A

_____ Is the location of the trench marked by banners, barricades, or other signals?
29 CFR 1926.651(f)

Entrance/Exit Precautions

_____ Is a safe means of egress (stairway, ladder, ramp) provided in a trench four or more feet deep? 29 CFR 1926.651(c)(2)

_____ Is a ladder within 25 feet of all employees working in a trench 4 or more feet deep? 29 CFR 1926.651(c)(2)

Competent Persons

_____ Does a competent person inspect the trench at the beginning of each day and throughout the day as needed? 29 CFR 1926.651(k)(1)

_____ Is the trench inspected by a competent person following any amount of rain? 29 CFR 1926.651(h)(3); .651(k)(1) Utility Involvement

_____ Has the utility company been notified of the excavation work schedule and asked to establish the location of the utility underground installations? 29 CFR 1926.651(b)(2)

_____ Has the location of underground utility lines been identified?
29 CFR 1926.651(b)(1)

Water Accumulation

_____ Is the trench free of standing water or are adequate precautions in place against the hazards of water accumulation? 29 CFR 1926.651(h)(1)

_____ Is the proper water removal equipment operating under guidance of a competent person? 29 CFR 1926.651(h)(2)

_____ Are diversion ditches or dikes in place to prevent surface water from entering the trench? 29 CFR 1926.651(h)(3)

Sloping and Benching

_____ Is the sloping and benching system designed per OSHA requirements?
29 CFR 1926.652(b)(1) to (4)

_____ Is the aluminum hydraulic shoring system designed per OSHA requirements?
29 CFR 1926.651(c)(1)

_____ When a combination of sloping and shielding is used, does the shield extend 18 inches above the bottom slope of the excavation? 29 CFR 1926, Subpart P, Appendix B

Hazardous Atmospheres

_____ Is the air quality in the trench tested if a hazardous atmosphere is suspected?
29 CFR 1926.651(g)(1)(i) & (iv)

Emergency Response/First Aid

_____ Is an emergency response program in place? 29 CFR 1926.35(a)

_____ Is emergency rescue equipment readily available, in working order, and attended when in use? 29 CFR 1926.651(g)(2)(i)

Shoring and Shielding Systems

_____ Are employees protected from cave-ins when entering and exiting a shield?
29 CFR 1926.652(g)(1)(iii)

_____ Are protective support systems installed in a manner that protects employees?
29 CFR 1926.652(e)(1)(ii)

_____ Are protective support systems dismantled from the bottom up?
29 CFR 1926.652(e)(1)(v)

_____ Is the timber shoring system designed per OSHA requirements?
29 CFR 1926.651(c)

_____ Is the excavation backfilled as the protective system is dismantled?
29 CFR 1926.652(e)(1)(vi)

_____ Is the shielding system designed per OSHA requirements?
29 CFR 1926.652(c)(1) & (2)

_____ Are shields free from damage or defects? 29 CFR 1926.652(d)(1)

ATTACHMENT 4 - EXCAVATION PERMIT

Date: _____

COMPETENT PERSON: (Name and Telephone Number)

- Primary: _____ Alternate: _____

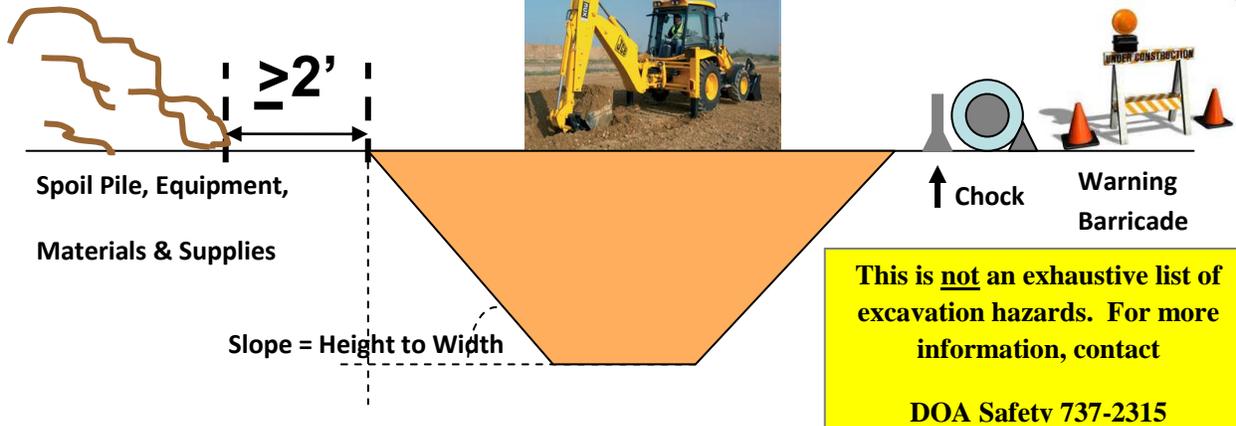
WORK CREW: Attach List of Employees by Name; Indicate All Relevant Training is Current

EXCAVATION: Location - _____

NOTE: A diagram is often helpful to understand placement of the excavation and materials

- **Length -** _____ **Width -** _____ **Depth -** _____
 - ___ Over 4' but Less Than 20' Deep:
 - Competent Person Can Select Worker Protection System
 - ___ Test Atmosphere (per confined space entry using multi-gas monitor)
 - ___ 20' or More Deep – Professional Engineer Must Design Protection System
 - ___ Over 5' Deep – Protection System and Soils Classification Required:
 - ___ Sloped ___ Benched
 - ___ Type A - 3/4:1 ___ Type B – 1:1 ___ Type C – 1/2:1
 - ___ Shoring:
 - ___ Timber (See OSHA Tables)
 - ___ Hydraulic – According to Manufacturer's Data
 - ___ Shielding - According to Manufacturer's Data
- ___ **Underground Utilities Marked** (water, sewer, electrical, steam, fuel, UST, etc.) - call **8-1-1**
- **Locations for Spoil Pile and Excavating Equipment:** _____
- **Means of Egress:** ___ Ladder ___ Ramp ___ Other
- **Vehicle/Pedestrian Security:** ___ Barricades ___ Warning Signs ___ Fencing
- ___ **Weather Forecast** (rain) / **Ground Water Level**
- ___ **Duration More Than One Day** Requires Daily Inspection by Competent Person
- **Other Hazards, Controls, Special Conditions or Comments:**

**Excavation /
Trench Safety**



**This is not an exhaustive list of excavation hazards. For more information, contact
DOA Safety 737-2315**

- Check with utility companies before digging to locate underground utilities; maintain 10' or more clearance from overhead power lines
- Deeper than 4':
 - Requires means of egress within 25' of Entrant: Ladder or Ramp
 - Treat as Permit Required Confined Space (use Permit & Rescue Equipment)
- Competent Person must:
 - Plan excavations over 4' deep
 - Get Professional Engineer to design protection system if over 20' deep
 - Select proper protective system
 - Perform soil classification for proper angle for sloping / benching
 - Inspect the excavation, adjacent areas and protective system:
 - Daily prior to start of work
 - Throughout the shift
 - After every rainstorm or other events that increases the hazard of collapse
 - Keep excavated materials and supplies stored:
 - At least 2 feet from the edge of the excavation
 - Neatly stacked & chocked to keep from rolling into the excavation
 - Use spotters and hand signals for vehicles and equipment operated near the excavation
 - Order evacuation for rain, water leak, signs of impending collapse or other hazards
 - Provide proper site security, i.e., chain link fencing, warning barricades & signs

Egress Ladder



Stored Materials



Warning Sign



Security Fencing

