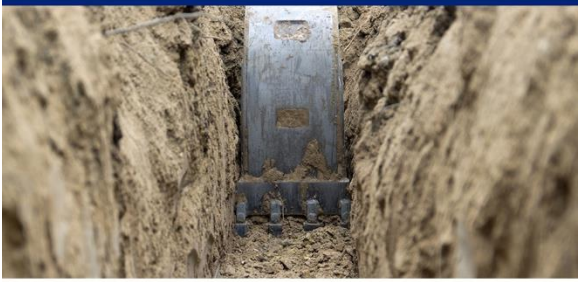
CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Trenching & Excavation Safety



Committing to a Culture of Safety

Inside Front Cover
Blank

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Table of Contents

Committing to a Culture of Safety 6
Introduction..... 7
Safety Responsibilities..... 7
Definitions..... 14
Plan Before You Dig 23
Underground Utilities 23
Time Between Locate Requests and Site Markings 24
Ticket Life 26
No Mechanized Equipment Zone 27
Working Near Overhead Power Lines 29
Required PPE..... 29
Tool Safety 31
Traffic Control 32
Surface Encumbrances 33
Access and Egress 33
Exposure to Vehicular Traffic 35
Working Around Heavy Equipment 35
Warning Systems 37
Rigging Methods..... 38
Exposure to Falling Loads 39
Hazardous Atmospheres 39

Water Accumulation Hazards 40
Stability of Adjacent Structures 42
Loose Rock and Soil Protection 43
Inspections 44
Fall Protection 45
Protecting Public from Hazards..... 46
Emergency Rescue Equipment..... 48
Soil Classification 50
Common Soil Problems 52
Soil Types..... 58
Protective Systems..... 70
Sloping 72
Benching 76
Shoring..... 81
Shielding 84
Use of Ultra Shore Shields..... 87
Tabulated Data..... 90
Preparing for an OSHA Inspection..... 95
The Inspection Process 97
The Interview Process 103
Contact List 112

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

3rd Generation Owners

Joseph F.Casilli
Executive Vice President

Jeffrey D.Casilli
Executive Vice President

Risk Management

Brianna G. Kline
MS, MA, CSP, SPHR
Chief Risk Officer

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Casper Colosimo & Son, Inc.

Since 1948

Casper Colosimo & Son, Inc. (CCSI) is a 3rd generation, family owned company that has been in business for over 70 years specializing in underground utility construction, including services for oil and gas, paving and landscaping restoration.

With every project, CCSI serves as the entrusted, full-service partner with our clients, providing consistent quality work with a focus on the safety of our people and the satisfaction of the communities in which we service.

CCSI was formed as a partnership in 1948 by Frank Colosimo, Joseph Casilli and later proceeded by Francis Casilli. Now on their 3rd generation of owners, the company has grown to more than 200 employees with offices in Pennsylvania, Maryland and Virginia.

Despite many changes in our industry since the company's formation, our success largely comes from using a values-driven, hands-on management approach, maintaining a culture that commits to excellence in every area.

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Committing to a Culture of Safety

It is the policy of CCSI leadership and employees to conduct our business in a responsible manner with regards to safety, social responsibility, and environmental health. With safety as a core value of our organization, we aim to provide a service to our customers in a safe productive manner.

We are committed to providing a safe working environment for our employees and clients. This level of protection and awareness is only achievable through a shared vision and commitment from every employee. Through a dedicated effort of leading by example, employee training, awareness, and improvement; safety will be a cornerstone of our company.

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Introduction

Excavation and trenching are among the most hazardous construction operations. The Occupational Safety and Health Administration's (OSHA) Excavation standards, 29 Code of Federal Regulations (CFR) Part 1926, Subpart P, contain requirements for excavation and trenching operations.

This handbook highlights key elements of the standards and describes safe work practices that can protect workers from cave-ins and other hazards.

Safety Responsibilities

Preventing injuries during trenching and excavation activities is a cooperative effort between CCSI and its employees.

It is the responsibility of each superintendent and foreman to implement and maintain the procedures and steps set forth

in this program. Each employee involved with excavation and trenching work is responsible to comply with all applicable safety procedures and requirements of this program.

Employer & Chief Risk Officer (CRO) Responsibilities

It is the responsibility of CCSI to:

- Train employees in trenching and excavation safety practices;
- Ensure excavations and trenching operations remain safe for every employee;
- Ensure a competent person is present at every excavation or trench with the knowledge and authority to identify hazards, ensure efficacy of controls and take immediate action to remedy unsanitary, hazardous or dangerous situations;
- Ensure employees are protected from low-oxygen and hazardous atmospheres;

- Provide a means by which employees may enter and exit trenches and excavations safely;
- Ensure pre-excavation planning addresses all hazards that may exist;
- Provide employees with all necessary personal protective equipment including respiratory protection devices, warning vests, and hard hats;
- Provide support systems to ensure the stability of excavation faces and nearby structures as necessary;
- Ensure the safety of materials and equipment used for protective systems; and
- Ensure regular inspections occur, and that unsafe situations or activities will be remedied as soon as possible.

Superintendent's Responsibilities:

The duties and responsibilities of the Superintendent are as follows:

- Actively supports jobsite safety by including safety as a part of pre-job planning and scheduling;
- Evaluates job specifications for potential safety and health hazards and reviews them with the CRO;
- Actively supports and participates in the implementation of safety program on the job;
- Requires Foremen to coordinate and communicate jobsite safety and health control measures among employees and other contractors on the job;
- Is familiar with safety regulations and directs and coordinates safety activities within and related to area of responsibility;
- Ensures that Foremen are aware of and comply with requirements for safe practices and conditions

- to be maintained on jobsites; and
- Provides information and recommendations to the CRO concerning safety matters.

Competent Person Responsibilities

It is the responsibility of the assigned “competent person” to:

- There must be at least one person designated as the competent person on every job;
- This person is responsible for overall safety of the jobsite and the workers;
- Stop work when a hazard threatens an employee’s health or safety;
- Inspect excavations for hazardous conditions including possibility of cave-ins and protective system failures before the start of work, and as needed;
- Test for hazardous or low-oxygen atmosphere;

- Perform inspections to ensure safety of equipment and material;
- Ensure effective water removal operations; and
- Determine soil type by appropriate testing.

Employee Responsibilities

Employees are expected to:

- Follow company policy and the directions of the competent person and supervisors;
- Participate actively in training, safety meetings, inspections and incident investigations;
- Inspect the trench before entering and refrain from entering an unprotected trench or any trench or excavation that may endanger his or her health or safety;
- Exit the trench and call the competent person if evidence emerges of problems with a protective system;

- Evacuate a trench immediately when told to do so by authorized personnel and when any potentially unsafe conditions emerge;
- Wear personal protective equipment as required and follow all rules for proper use, cleaning and storage; and
- Stay out from under loads and away from vehicles being loaded or unloaded.

Truck Driver Responsibilities

Truck drivers around trenching and excavations must adhere to the following rules:

- Understand and obey the flagger or signaler at all times;
- Remain in the cab where possible;
- Ensure that mirrors are clean, functional, and properly adjusted;

- Do a circle check after being away from the truck for any length of time (walk around the truck to ensure the area is clear before moving); and
- Stop immediately when a flagger, signaler, worker, or anyone else disappears from view.

Definitions

Adjacent

The area within a horizontal distance from the edge of a vertical-sided excavation equal to the depth of the excavation.

Aluminum hydraulic shoring

A pre-engineered system of aluminum hydraulic cylinders (cross braces) and vertical rails (uprights) or horizontal rails (walers). Designed to support the faces of an excavation.

Benching

A method of sloping the sides of an excavation by forming a series of steps. Benching cannot be done in Type C soil.

Cave-in

The separation of a mass of soil or rock from the face of an excavation into an excavation.

Competent Person

A person capable of identifying existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate the hazards.

Cross Brace

System installed perpendicular to the sides of an excavation, the end of which bears against uprights or wale.

Excavation

A man-made cut, cavity, or depression in the earth's surface.

Face

The side of an excavation.

Hazardous Atmosphere

An atmosphere that could cause an injury or illness. Examples: explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, or toxic.

Previously Disturbed Soil

Soil that has been disturbed from excavation work or other digging. Soil cannot be classified type A if it has been previously disturbed. Use visual tests to identify previously disturbed soil.

Protective system

A system designed to protect workers in excavations. Sloping and benching, shores, and shields are examples of protective systems.

Ramp

An inclined walking or working surface constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer

Professional engineer registered in the state where the work is performed. A professional engineer registered in any state can approve designs for manufactured protective systems or tabulated data used in interstate commerce.

Sheeting

Component of a shoring system that prevents soil from sliding into an excavation.

Shield

A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect workers within the structure.

Shoring

A structure such as a metal hydraulic, mechanical, or timber system that supports the sides of an excavation and is designed to prevent cave-ins.

Sloping

A technique that employs a specific angle of incline on the sides of the excavation. The angle varies based on assessment of impacting site factors.

Soil

Weathered rock, gravel, sand, or combinations of clay, silt, and loam.

Stable Rock

Natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed.

Structured Ramp

A ramp made of steel or wood, usually for vehicle access. Ramps made from soil or rocks are not considered structural ramps.

Support System

A system that supports an adjacent structure, underground installation, or the face of an excavation.

Surcharge

A load exerted on ground adjacent to an excavation.

Tabulated Data

Tables and charts, approved by a registered professional engineer, used to design and construct a protective system. At least one copy of the data and the name of the engineer who approved it must be kept at the site while the system is constructed.

Registered Professional Engineer

Any person who by education and training, having passed the requirements for registration, is registered as a professional engineer in the state in which work is being performed.

Trench

A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width is no greater than 15 feet.

Upright

The vertical member of a shoring system.

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Plan Before You Dig

Plan Before You Dig

How you pre-plan the job is important because it effects productivity and safety. Not having the tools, you need when you need them slows down the job.

Making unnecessary trips to retrieve your materials and equipment only increases the likelihood of an accident. A basic rule for excavation is, “plan your dig, then dig your plan.” If you encounter something unplanned for, then stop and re-plan.

<u>Underground Utilities</u>

- Such as sewer, water, gas lines, communications, and electric lines must be identified, and physically located.

- To access specific information about your state visit http://call811.com/811-your-state
- Call the local area utility locator company, give them the location or the route and depth of the proposed excavation and request utility locations.
- Have your own serial number for One Call Notification (do not use someone else's)

Time Between Locate Requests and Site Markings

- Usually the locator company requires a minimum of 48 hours advance notice. Give them as much lead time as possible.
- Pennsylvania State law requires a three (3) business day notice (does not include state holidays or weekends), but not more than ten (10) business days prior to the start of excavation.

- A business day begins at 12:00:00 a.m. and ends at 11:59:59 p.m.
- The first lawful start date for your excavation is determined by your scheduled excavation date (the day you plan to start digging), work should not begin prior to your first lawful start date but no later than 10 business days from the day of your call.
- In the State of Virginia, the 2-working day marking period starts at 7 AM on the next working day after the call. It does not include weekends or official state or federal holidays. If you call Miss Utility at 10 AM on a Friday, your 2 day marking period is over at 7 AM on the following Wednesday (Saturday and Sunday don't count).
- Everyone digging in Maryland must give notice at least 2 full business days prior to the day they plan to start work. The day of the call is not counted as one of these days.

Ticket Life

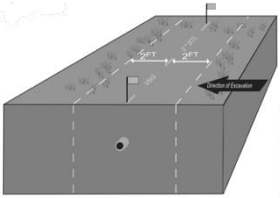
- In the State of Pennsylvania, you are not required to re-notify the one call system every ten days. However, you must re-notify the one call system if working in a new area, if the scope of the work is changed, if you leave the worksite and remove equipment for more than 2 working days, or if the original markings are lost.
- In the State of Virginia, your notification is valid for 15 business days from 7:00 AM on the next business day after you notify VA811.
- Request a re-marking of the underground utility lines if the line-location markings on the ground become illegible, for any reason.
- Notify VA811 three (3) business days before your ticket expires, and request a re-marking of the underground utility lines if you need to continue to excavate past the date your ticket is valid.

- The ticket life in the State of Maryland is 12 business days after the day on which the ticket is transmitted by Miss Utility to the owner-members.
- When located, the utility must be physically and cautiously exposed.
- Once the utility is uncovered, it becomes your responsibility to support, protect or have the utility removed as necessary.

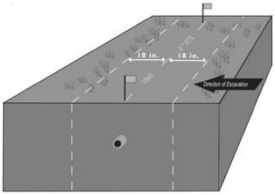
No Mechanized Equipment Zone

- Prudent digging techniques must be used which may include hand dug test holes, vacuum excavation or similar devices to ascertain the precise position of facilities.
- The tolerance zone in Pennsylvania is 18 inches on either side of buried installation.

- The tolerance zone in Virginia is 24 inches on either side of buried installation.
- The tolerance zone in Maryland is 18 inches on either side of buried installation.



Tolerance zone in VA



Tolerance zone in PA / MD

- Locating all buried utilities that cross or parallel your route may be time-consuming, but failure to do so could have serious consequences.
- Any and all buried installation damage must be reported, regardless of who caused the damage.

Working Near Overhead Power Lines

- All excavating equipment must maintain a minimum of 10 ft. from overhead power lines rated 50kV or less, with 0.4in. of clearance added for every kV over 50.
- Adherence to this requirement will prevent the equipment from contacting the energized line, and it will minimize the possibility of electrical arcing.

Required PPE

- Hard hat, hearing protection, eye protection, boots, reflective safety vest, gloves
- When you are working on a road construction site, always wear the following basic protection;

- A hardhat, sturdy boots with slip resistant soles, and high visibility clothing must be worn at all times.

- Face protection must be worn anytime operations create a hazard of flying particles.
- A face shield and hearing protection must be worn in addition to safety glasses when performing cutting operations.
- Hand protection should be worn according to the hazard present.
- Cut resistant gloves must be worn when handling materials with sharp edges.

Tool Safety

- Employees are responsible for inspecting their tools, equipment, and personal protective equipment before each shift to verify satisfactory condition and identify if any damage or defects are present.

- All damaged tools and equipment must be removed from service immediately.
- All personnel must be trained in the correct operation of tools and equipment they are using.
- The operator must carefully read and follow any warnings, safety signs and instructions provided with or located on the equipment.

Traffic Control

- Work zone traffic control is one of the most critical functions in providing a safe work environment for workers in street and highway construction.
- Traffic controls for utility construction on highways and road construction work zones must meet the requirements of the Federal Manual of Uniform Traffic Control Guidelines.
- Utilizing law enforcement personnel can also be an effective means of controlling traffic and reducing speeds throughout the work zone. surface.

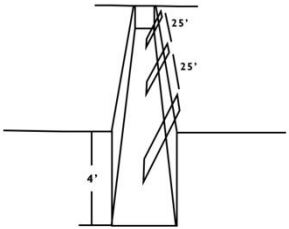
Surface Encumbrances

- Includes trees, signs, sidewalks, power poles, parking lots, and walls which must be removed, braced, shored, or otherwise supported to prevent a hazard.

Access and Egress

- Any trench or excavation four feet or deeper must have a means of exit. Ladders and / or ramps must be located no more than 25 feet from any employee while he or she is in the excavation.

- Another good safety practice is to ensure that ladders extend three feet above the surface of the excavation and be tied off if possible.
- Structural ramps that are used to enter and exit the excavation must have nonslip surfaces and be designed by a competent person. A competent person must also evaluate ramps made from soil that are used to enter and exit an excavation.



Any trench or excavation four feet or deeper must have a means of exit. Ladders and/or ramps must be located no more than 25 feet from any employee while he or she is in the excavation.

Exposure to Vehicular Traffic

- Workers exposed to vehicular traffic must wear "high visibility" vests or clothing.

Working Around Heavy Equipment

- Be aware of the excavator's swing area and blind spots. Always maintain at least three feet of unimpaired clearance between the excavator's rotating superstructure and adjacent objects.
- Keep others outside the area by marking it with rope, tape, or a similar barrier, if necessary.
- Post warning signs that say DANGER – STAY CLEAR on all sides of the excavator.
- Don't allow anyone to stand under a suspended load or the boom, arm, or bucket.
- Keep the bucket as close to the ground as possible when workers are attaching loads.

- Lower the boom to a safe position with the bucket on the ground and turn off the excavator before getting off.
- Follow the manufacturer's instructions for using positive locks on quick-disconnect equipment.
- Make frequent visual inspections of quick-disconnect systems especially after changing attachments.
- Never work under suspended loads and spotters must be in place when equipment is in motion and during lifts.
- And remember if you can't see the operator – they can't see you…
- Overhead and underground electrical powerlines must be located, identified and avoided.

- Warning signs and flags identifying overhead lines must be in place and designate a spotter to observe clearance between the equipment and the powerlines.

Warning Systems

- All mobile equipment (front-end loaders, bulldozers and dump trucks) must be equipped with a warning device such as a backup alarm if the operator does not have a clear and direct view of the edge of the excavation.
- Some other good safety practices are use of hand signals from a flag person, stop logs, barricades or other mechanical signals. An attentive operator and a flag person who knows and uses proper hand signals provide the safest method.

Rigging Methods

- Follow the instructions in the operator's manual when using an excavator to lift or move an object.
- "Lift and drag" to move a trench shield horizontally in a trench; avoid "plowing" with the front of the shield. Plowing significantly increases the tension on the slings.
- Workers must stay out of the "box" while it is being moved.
- Never use damaged chains or frayed cables, slings, straps or ropes.
- Use an appropriate lifting shackle for attaching cables or slings.
- Never stand in line with, or next to, a sling that is under tension.

Exposure to Falling Loads

- Under no condition should workers be permitted under loads handled by lifting or digging equipment. Workers must stand away from vehicles being loaded or unloaded.
- Vehicle operators may stay in their vehicles during loading or unloading, provided they are protected by a cab constructed in accordance with *29 CFR 1926.601(b)(6)*.

Hazardous Atmospheres

- In excavations over 4ft in depth, a potential for the accumulation of hazardous gases or vapors exists.

- Sources of hazardous atmospheric contaminants include the exhaust of equipment in or near the excavation, lateral movement through soils of natural gas, gas-line ruptures, and landfill gases (when excavating in landfills).
- If there is any reason to suspect that a toxic atmosphere is, or likely to be, present in the excavation, then the atmosphere must be tested prior to working in it.
- Ventilation or respiratory protection may be needed to protect workers from harmful atmospheres.

Water Accumulation Hazards

- Workers must not work in excavations where water is accumulating unless adequate precautions are taken to protect these workers from these hazards.

- Methods of water control may include but not limited to:

    - Water removal pumps
    - Well points
    - Water diversions
    - Shield systems

- This protection involves specific shoring, water removal (to control the level of accumulating water), use of lifelines, harnesses, and careful monitoring by a competent person.

Stability of Adjacent Structures

- Excavation below the base or footing of a foundation, wall, sidewalk, pavement, or other structure is not permitted unless:

  - Shoring or bracing is provided to prevent cave-in
  - Excavation is in stable rock
  - A registered professional engineer determines the structure is far enough away that the excavation is not affected or that the excavation will not pose a threat to the workers

Loose Rock and Soil Protection

- Excavated earth (spoil), materials, tools, and equipment shall be placed no closer than two feet from the edge of the excavation.
- Rock and soil should be scaled off the face of the excavation or retained by shoring or other acceptable methods to prevent the material from falling and striking workers.
- Good work practice should dictate that no person will work on the sides of the slope or benched excavation above other workers unless the lower workers are protected from falling materials.
- If possible and practical, grade the slope away from the excavation.

- This serves a dual purpose of keeping equipment and vehicles from accidentally rolling into the excavation and directing rain water away from the excavation *OSHA 1926.100(a*) requires the use of hard hats where there is a possible danger of head injury from falling objects.
- Excavation operations expose workers to these hazards in every work zone during excavation.

Inspections

- A competent person must inspect the excavation and its support system for evidence of a situation that could result in possible cave-ins, indications of failure of the protective system, hazardous atmospheres, or other hazardous conditions.

- The inspections shall be done prior to start of work and as often as needed throughout the shift. Inspections shall be made after every rainstorm or other hazard-increasing occurrence.
- When an inspection finds evidence of a situation that could result in a hazard to the worker, exposed workers will be removed from the hazardous area until necessary precautions have been made to ensure their safety.

Fall Protection

- Where personnel and/or equipment must cross an excavation, a walkway or bridge must be engineered to withstand the maximum expected load.
- The walkway or bridge shall be provided with standard guardrails that meet OSHA standards outlined in *29 CFR 1926 Subpart M*.

- *A* walkway must be provided across a trench if width is 30 inches or more (guarded if trench depth = 6 ft. or more).
- Barricades must be erected along the edge of an excavation if the edge is not readily seen by workers or equipment operators.

Protecting Public from Hazards

- Precautions must be taken to ensure potential risks to the public are minimized.
- Measures should be established to restrict public access to the jobsite.
- Install perimeter fencing where practicable.
- If access control is not possible, items that may create a hazard should be locked, barricaded, or removed.
- Display reflective signs and/or lights as necessary.

- Provide distinct routes for pedestrians and traffic to safely pass.

Specific hazards within the jobsite that should be considered include, but are not limited to:

- Open excavations, holes and openings, machinery and vehicles, dust, access to hazardous substances flammable materials, and equipment when unattended.

Every day prior to the completion of work, construction sites are to be made safe by means such as:

- Backfilling excavations
- Covering of holes
- Placing fencing, barricades and signage near work zone.

Emergency Rescue Equipment

- An emergency action plan must be in place and include the following:
  - Ensure adequate cell phone signal
  - Address of worksite, and
  - Ensure basic response protocol communicated, etc.
- Where there is a hazardous atmosphere condition or a reasonable expectation that one may develop, emergency rescue equipment must be readily available and attended.
- If an employee enters a confined excavation he or she must wear a harness with an attached lifeline.
- The lifeline must be separate from lines used for material handling and be attended while the employee is in the excavation.

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Soil Classification

Soil Classification

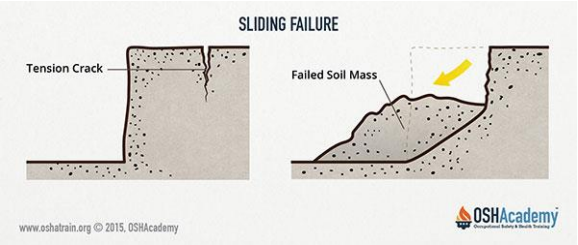
Introduction

This section will provide information on soil mechanics, procedures to reduce the possibilities of cave-ins during excavation, identifying the four Occupational Safety and Health Administration (OSHA) soil classifications, and simple soil identification tests and procedures.

One cubic yard of dirt weighs an average of 2,700 pounds, and a cave-in is like dropping a small car from one foot above your head.

To excavate and trench safely, you must know about soil mechanics and how to slope and shore. Horizontal and vertical forces within the earth keep undisturbed soil in place. An excavation disturbs or eliminates these forces.

Soil naturally moves downward and inward. A number of factors govern how fast this occurs, such as soil type, moisture, vibration and surface loading.



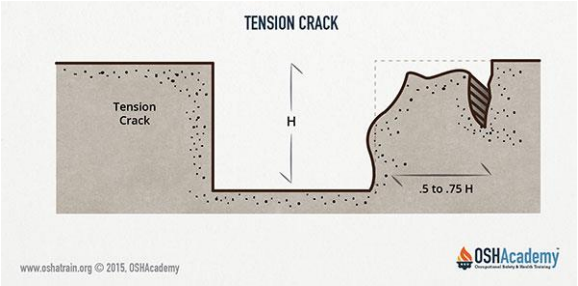
Soil Mechanics

The type of soil governs the stability of the excavation. OSHA requires that soil classification be made by a competent person and installation of adequate protective equipment be made before workers enter the excavation.

Common Soil Problems

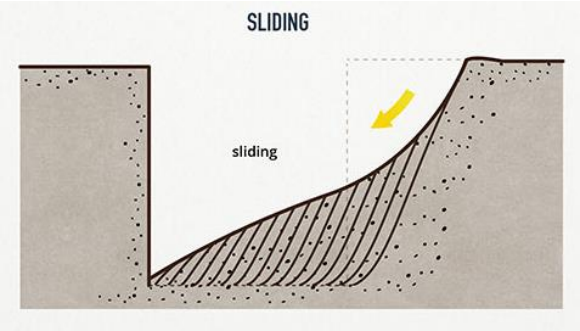
Tension Cracks

Tension cracks usually form at a horizontal distance of 0.5 to 0.75 times the depth of the trench, measured from the top of the vertical face of the trench.



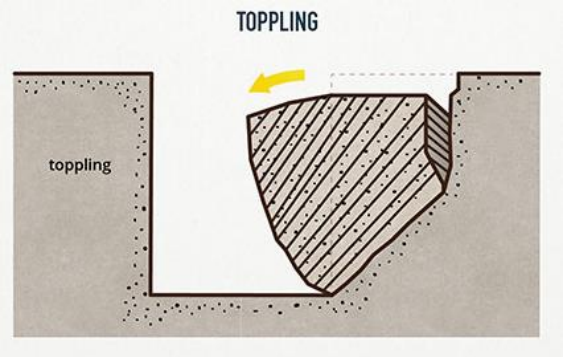
Sliding or Sluffing

Sliding or sluffing may occur as a result of a tension cracks.



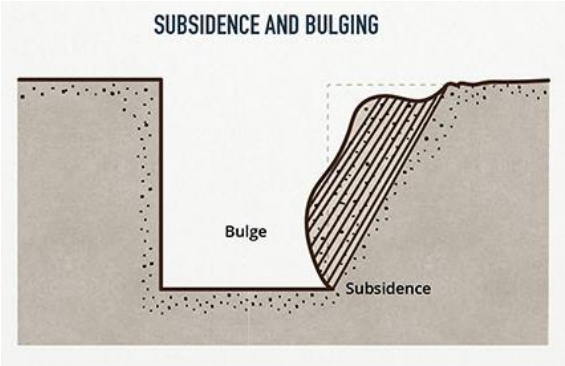
Toppling

In addition to sliding, tension cracks can cause toppling. Toppling occurs when the trench's vertical face shears along the tension crack line and topples into the excavation.



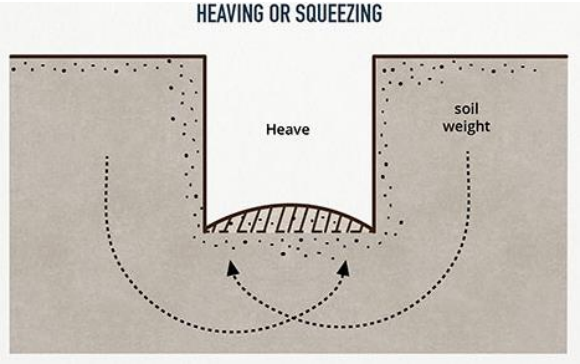
Subsidence and Bulging

An unsupported excavation can create an unbalanced stress in the soil, which in turn, causes subsidence at the surface and bulging of the vertical face of the trench. If uncorrected, this condition can cause face failure and entrapment of workers in the trench.



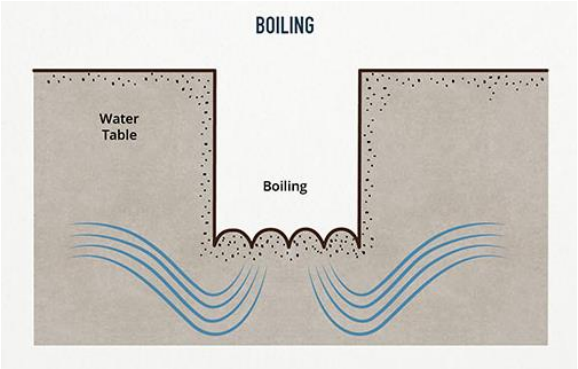
Heaving or Squeezing

- Bottom heaving or squeezing is caused by the downward pressure created by the weight of adjoining soil.
- This pressure causes a bulge in the bottom of the cut, as illustrated in the drawing below.
- Heaving and squeezing can occur even when the shoring or shielding has been properly installed.



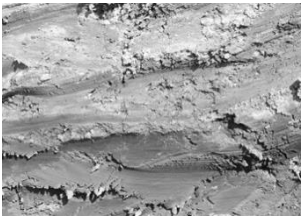
Boiling

Boiling is evidence by an upward water flow into the bottom of the cut. A high-water table is one of the causes of boiling. Boiling produces a “quick” condition in the bottom of the cut and can occur even when shoring or trench boxes are used.



Soil Types

Type A Soil

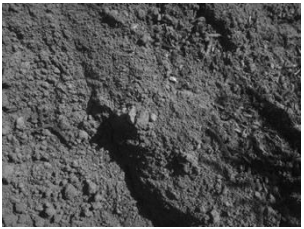


This is the most stable soil and is composed of clay, silty clay, clay loam and sandy clay. It has an unconfined compressive strength of 1.5 tons per square foot (t/sf) or greater. Type A soil is very cohesive. Unfortunately, people wrongly assume it is stable and will not collapse if not shored

No soil, no matter the composition or apparent stability, can be classified as Type A soil if the soil is fissured or subject to vibration from traffic, equipment, or other excavation activities.

Soil cannot be classed as Type A soil if layers dip into the excavation on a slope of four feet horizontal to one foot vertical or there are other factors, such as seeping water, that would make the soil less than stable.

Type B Soil



This cohesive soil is composed of silt, silty loam, sandy loam, and granular cohesive solids including angular gravel (crushed rock). It has an unconfined strength greater than 0.5 tons per square foot but less than 1.5 tons per square foot.

Type C Soil

This is the least stable soil. It is a non-cohesive soil composed of granular soils, including sand, gravel, loamy sand, submerged soil or soil from which water is draining, submerged rock, or soil in a sloped layered system where the layers dip into the excavation at a slope of four feet horizontal to one foot vertical or greater. It has an unconfined compressive strength of 0.5 tons per square foot or less.

Stable Rock

This natural solid mineral material can be excavated with vertical sides and remains intact while exposed.

How Soil is Tested

A competent person must conduct **visual** and **manual** soil tests before anyone enters an excavation.

Visual and manual tests are a critical part of determining the type of protective system that will be used.

Visual Tests

Visual testing involves looking at the soil and the area around the excavation site for signs of instability.

The competent person might do visual tests such as the following:

Soil Particle Size

- Usually there is a mixture of sizes. The percentage of sand to silt and clay determines the soil type.

Grain Size

- If a grain of soil is larger than a #2 pencil lead, it is classified as gravel. If it is smaller, but can be seen by the unaided eye, it is classified as sand.
- Clay and silt particles cannot be seen without the use of a microscope. A general statement is the larger the grain size the less stable the soil.

- Soil that clumps and holds together when dug out is most likely to be clay or silt.
- Cracks in walls of the excavation, with material spilling off (slabs of soil falling off the sides) indicates Type B or C soil.
- Standing water or water seeping out of the bottom or trench walls automatically classifies the soil as Type C.
- Layered soil adjacent to roadways or buildings, disturbed soil, or soil exposed to a source of vibration, requires a soil classification to be made by a registered professional engineer.

Manual Testing

- Protective system requirements are based on the results of testing.

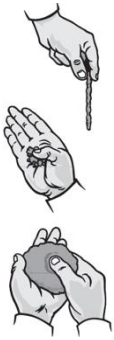
- ***Never*** enter an unprotected excavation to obtain a soil sample.
- Take the soil sample from freshly dug material in the spoil pile.
- The tests should be done as soon as possible to preserve the sample's natural moisture.

Dry Strength

- If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand or silt).
- If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt.

- If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

Thread Test (plasticity)



- This determines whether a sample is cohesive. Roll a sample of the soil between the palms of your hands to about one-eighth inch diameter thread at least several inches long.
- Place the rolled soil thread on a flat surface and pick up by one end. If the sample holds together for two inches without breaking, it is considered cohesive.

Ribbon Test

- This is another test for cohesiveness and is used as a back-up test for the thread test.
- Roll a representative soil sample into a cylinder about three-fourths inch in diameter and several inches in length.
- Then squeeze this sample between thumb and forefinger into a flat unbroken ribbon one-fourth to one- eighth inch thick, which is allowed to fall freely over the fingers.
- If the ribbon does not break off before several inches are squeezed out, the soil is considered cohesive.

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Thumb Penetration Test

The thumb penetration test estimates the unconfined compressive strength of cohesive soils and is based on testing described in the American Society for Testing and Materials (ASTM) standard D2488. Take a soil sample collected from a freshly dug soil clump from the spoil pile. Press your thumb against the sample. If the sample is readily indented by your thumb but penetration can be done only by using great effort, then the soil is classified as Type A. If penetration occurs to the base of the thumb nail and is accomplished with moderate difficulty, then it is Type B. If the sample can be penetrated easily several inches by the thumb, and if it can be molded by light finger pressure, then the soil is Type C. Drying the sample can greatly influence the results of this test. Perform this test immediately after taking the sample.

Mechanical Devices

Mechanical devices for determining soil type include the pocket penetrometer and the hand-operated vane shear penetrometer. Operation of the device and interpretation of the results are found in the manual or literature furnished by the manufacturer of these devices. For a complete discussion of soils and testing, refer to the *29 CFR 1926 Subpart P*, *Appendix A*.

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Protective Systems

Protective Systems

Introduction

Excavation workers are exposed to many hazards, but the chief hazard is danger of cave-ins. There are four recognized methods of protection: sloping, benching, shoring and shielding (trench box).

OSHA requires that in all excavations employees exposed to potential cave-ins must be protected by sloping or benching the sides of the excavation, by supporting the sides of the excavation, or by placing a shield between the side of the excavation and the work area.

Designing a protective system can be complex because of the number of factors involved:

- Soil classification
- Depth of cut
- Water content of soil
- Changes due to weather and climate
- Other operations in the vicinity

Requirements

OSHA states, “each employee in an excavation shall be protected from cave-ins by an adequate protective system.”

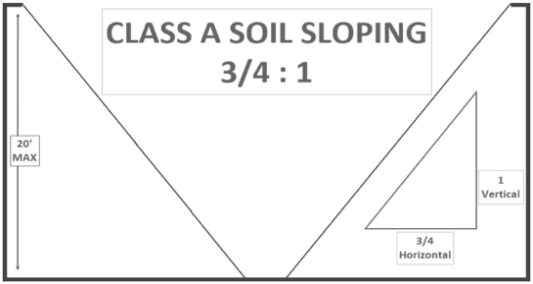
Sloping and Benching

Sloping

A protective measure that cuts the walls of the excavation back at an angle from the floor to produce a stable slope. The slope angle is based on soil type. The flatter the angle of the slope, the greater the protection factor for the employees.

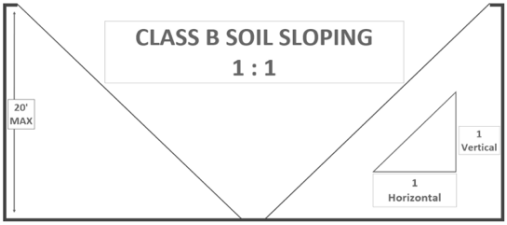
Type A Soil

The ratio is ¾ ft. horizontal for every foot vertical (53° from the horizontal)



Type B Soil

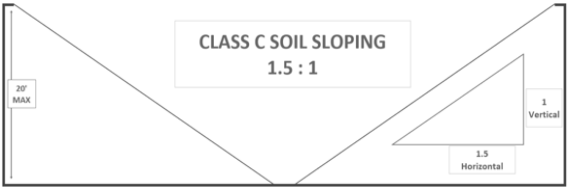
The ratio is 1 ft. horizontal for every foot vertical (45° from the horizontal)



CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Type C Soil

The ratio is 1 1/2ft. horizontal for every one foot vertical (34° from the horizontal)

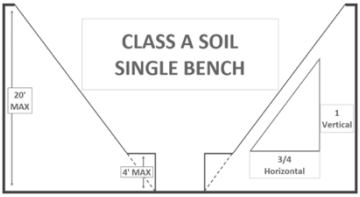


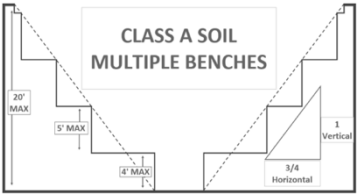
Benching

The process of cutting benches or steps into the excavation. The angle used for benching is based on a ratio of horizontal to vertical cuts. It should be noted that benching is reserved only for cohesive soils.

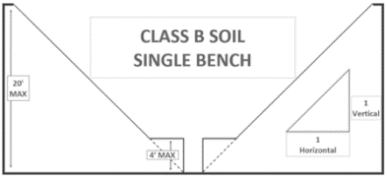
There are two basic types of benching: simple and multiple.

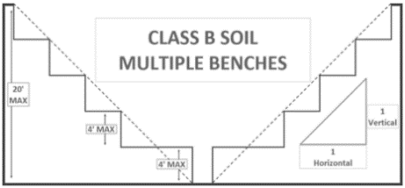
Type A: First vertical cut may only be a max of 4'. All other vertical cuts may only be a max of 5'.





Type B: All vertical cuts may only be a max of 4'. First horizontal cut must be 2x the height of the vertical cut.





It is not permissible to bench Type C soil because of its inability to support a vertical wall. Type C soils always require the use of sloping, shielding, or shoring.

Factors like these make soil less stable:

- Vibration from machinery or traffic;
- Exposure to rain or flooding;
- Periods of low humidity (drying); and
- Soil loading from overburden or equipment.

When these factors are present the excavation, whether benched or sloped, must be re-inspected for signs of distress.

Distress signs include:

- Cracking excavation walls;
- Cracks in the surface soil 1/2 to 3/4 the distance back from the excavation as the excavation is deep;
- Bulging of the trench wall; and

- Sloughing off clods or small sections from the trench wall.

These indicate an imminent danger of cave-in. If any of these signs are observed, employees shall be directed to evacuate the excavation and the slope shall be cut back further or a mechanical protective system installed.

Shoring and Shield Systems

Shoring and shield systems are protective measures that add support to an excavation.

The safest system is one that can be installed and removed without personnel entering the excavation.

Shoring

Shoring systems are structures of timber, mechanical, or hydraulic systems that support the sides of an excavation and which are designed to prevent cave-in.

This system is designed to prevent excavation failure (cave- ins) by supporting trench walls with a system of vertical uprights and/or sheeting and Cross braces (shores). Shores are structures that cross the trench and put pressure on the vertical uprights and sheeting. Shoring methods range from timber shoring to aluminum hydraulic devices that bear directly on the wall of the trench and

transmit approximately 1500 pounds per square inch (psi) of pressure to pre-load the soil.

This pressure preloading produces the so called “arch effect” that stabilizes the trench wall and prevents a cave- in. Information on timber shoring methods can be obtained from *29 CFR 1926,*

Subpart P, Appendix C. Appendix D has information for aluminum hydraulic shoring. This information can also be found at https://www.caspercol.com/.

Some safety requirements for using aluminum hydraulic shoring are as follows:

- Installation and removal of the shoring is done from outside of the excavation.
- Individual shores (elements) are pressurized and depressurized slowly to prevent failure of the

remaining shores or collapse of the excavation walls.

- Data provided by the manufacturer is tabulated and designed by a registered professional engineer (PE).

This information and procedures for use must be followed regardless of soil classifications. Any modification must be made by a registered professional engineer and approved in writing and sealed.

All shoring should be installed from the top down and removed from the bottom up. Hydraulic shoring should be checked at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and other damaged or defective parts.

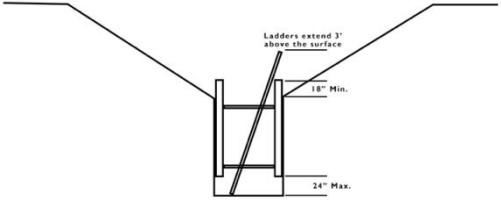
Shielding

A trench shield is an engineered metal box that is placed in the excavation. It does not provide structural strength to the excavation, but provides workers a safe worksite that protects them from collapsing material. A registered professional engineer must design the trench shield or trench box system which can be premanufactured or built on site as necessary. Regardless of where they are built, they must be constructed to exact engineering specifications. There are several safety requirements when using a trench box:

- Shields must be installed in a manner that restricts side- to-side movement or any other hazardous movement in the event of sudden lateral movement, i.e., trench failure.
- The shield system shall not be exposed to loads exceeding the design standard.

- Workers shall be protected from the hazards of cave- ins when entering or leaving the area protected by the shield.
- Workers shall not be allowed inside the shield or to ride on the shield, when the shield is being installed, removed or moved vertically.

- Shield structure shall extend a minimum of 18 inches above the lip of the excavation when used in conjunction with a sloped or benched excavation.
- Excavation may be permitted up to a depth of 2 feet below the bottom of the shield *provided* the shield is designed to resist the forces calculated for the full depth of the trench and there is no indication while the trench is open of a possible collapse of soil from behind or below the bottom of the shield.



- All excavations must be backfilled as soon as possible after removal of the support system.
- No worker is permitted in an unshored or unprotected excavation or trench no matter how compelling the reason.

Use of Ultra Shore Shields

If the excavation is over 5 ft. deep, a protective system shall be employed to prevent cave-in.

This requirement is the heart and soul of excavation safety and yet is the most misunderstood of all the OSHA excavation requirements.

This requirement mandates that all excavations greater than 5 ft. deep be shored, sloped, or otherwise physically prevented from collapsing.

It does not state that excavations under 5 ft. are always safe and need no protective system.

The correct interpretation is that *if* project site conditions are appropriate-such as cohesive soil, lack of vibration, short-term opening, upright body positioning during work-shallow excavations under 5 ft. may not need additional protective systems, based on a knowledgeable assessment by the competent person.

Historically contractors have incorrectly assumed that sloping or shoring is only required on excavations deeper than 5 ft.

Since the language of the standard allows for entry into a non-shored or non-sloped excavation less than 5 ft. deep, if deemed safe by a competent person, then this obviously

requires a designated competent person to make that determination on-site.

Unfortunately, many cave-ins and injuries result from shallow-excavation failures (primarily narrow trenches), and any subsequent OSHA investigation will begin with determining whether a competent person performed an assessment prior to worker entry.

Remember, one cubic yard of dirt is the weight of a mid-size car, and an unprotected trench can collapse in less than a second. You could die in minutes from a trench collapse even if your head and arms are above the dirt.

Given the scope of work we perform, CCSI requires all employees, regardless of excavation depth, to place a prefabricated protective metal shield (ultra-shore shield) in the excavation any time pipe installation / connection work is being performed. No exceptions.

Tabulated Data

- According to the OSHA Subpart P Excavations standard, “tabulated data” means tables and charts approved by a registered professional engineer and used to design and construct a protective system.
- The purpose of this tabulated data for shoring equipment is then to provide the contractor and those involved in developing a plan to shore a project with the necessary information to use the equipment in the context of the plan.

With excavation protective systems the following information is necessary and should be contained within a tabulated data sheet.

Physical Information

- A representation of what the equipment looks like, such as a photo or drawing
- Features and options related to the equipment, which may be specific to the type of equipment including adjustable and or hydraulic components as well as optional accessories
- Weight of the equipment so that the user may be able to determine how to safely handle the equipment
- The physical dimensions of the equipment (length, width and depth)

Structural Aspects

- Allowable loading of the equipment so that engineers may use the equipment in site specific shoring designs
- Allowable depth ratings by OSHA soil type
- Tables and charts used to determine element sizes and positioning within the trench
- Identification and capacity of structural elements that can vary with the system, such as spreaders and their allowable spans, hydraulic over-sleeve size and span, and allowable sheeting size and type, and
- An engineer's stamp

Every aspect and element of the installed shoring system must be addressed in the tabulated data for the shoring system to be in accordance with the data. For example, if trench plates are placed at the ends of a shoring shield and the plates are not discussed in the tabulated data, the shoring is out of conformance.

There may be extraneous cases, such as a ladder or handrail placed on a shoring box, that do not significantly impact the strength of the box that would not affect the warranty of the equipment, however, the user must consider the tabulated data when making these decisions.

Additionally, the tabulated data must be present at the jobsite so that the conformance of the shoring system can be checked at any point in time while the system is in use.

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Preparing for an OSHA Inspection

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Preparing for an OSHA Inspection

OSHA's National Emphasis Program

In response to a spike in worker fatalities and injuries, OSHA has updated its National Emphasis Program (NEP) on Trenching and Excavation.

According to the NEP directive, there were 130 fatalities recorded in trenching and excavation operations between 2011 and 2016. An alarming 49% of those construction fatalities occurred between 2015 and 2016.

Because of the continuing incidence of trench/excavation collapse and accompanying loss of life, the agency has determined that these worksites continue to warrant an increased enforcement presence.

OSHA has long maintained that employees exposed to potential cave-ins must be protected before the excavation face is in imminent danger of collapse, because OSHA believes that there is a potential for a collapse in virtually all excavations.

The NEP requires OSHA area and regional offices to concentrate their enforcement resources on employers performing work involving trenching and excavation.

Specifically, OSHA Compliance Officers will initiate inspections under the NEP whenever they observe an open trench or open excavation, regardless of whether or not a violation is readily observed.

In addition, the OSHA Compliance Officer may expand the scope of an inspection if other safety and health hazards or violations are observed in plain view and/or brought to their attention.

The Inspection Process

OSHA follows a general procedure when it decides to inspect a jobsite.

The following outlines this procedure, along with suggestions on how to act and respond during the actual inspection:

1.) Verify the OSHA Compliance Officer's Credentials

- When the compliance officer arrives, he or she should display official credentials.
- Explain to the compliance officer that your company's policy regarding OSHA inspections requires that you immediately contact the Company's CRO, Brianna Kline 412.370.1733, for further guidance.

- The CRO may want to be present during the inspection, in which case you may request that the officer wait until he/she arrives.
- If the OSHA compliance officer has a warrant, or insists upon proceeding with the inspection before the CRO arrives, the competent person should accompany the officer. Do not allow the officer to tour the job site by himself/herself.

2.) Be Polite and Respectful

- Once a compliance officer arrives onsite, it is important to maintain a business-like manner.
- If an employer refuses to admit an OSHA compliance officer, or if an employer attempts to interfere with the inspection, legal action may be taken.
- Answer all questions truthfully, but do not volunteer any information.

- Avoid making statements that might be construed as an admission of guilt, and do not speculate as to how an accident occurred.
- Explain items that the compliance officer does not understand or misinterprets, but do not argue.

3.) Participate in an Opening Conference

- The compliance officer will explain how the site was selected and explain the purpose of the visit and the scope of the inspection.

4.) Select Employer Representatives

- Before the compliance officer begins the inspection, the contractor will normally be asked to select a representative to accompany the inspector.

- An employer representative must accompany the inspector at all times during the walkaround.
- The employer representative must be either the competent person and/or a member of the Safety Department.

5.) Participate in the Walkaround

- During the walkaround, the compliance officer will observe safety and health conditions and practices; consult with employees privately, if necessary; take photos or videotape; take air and noise samples; and survey engineering controls. The scope of the walkaround is limited to the scope and purpose of the inspection.
- The compliance officer will sometimes point out any unsafe or unhealthy conditions during the inspection.

- The compliance officer may also discuss possible corrective action.

6.) Take Notes and Pictures

- The compliance officer will take notes, pictures and/or videotape.
- The employer representative should take a matching set of photographs from the same angle as the compliance officer and take notes on what the inspector has said and also note any items that were corrected immediately.
- Do not give the compliance officer free access to your document storage.
- Provide only those documents the officer specifically requests, and make a copy of each document before turning them over.
- Make a list of employees the compliance officer interviews.

7.) Participate in a Closing Conference

- After the walkaround is concluded, the compliance officer will describe the alleged violations and the OSHA construction safety standards that may have been violated.
- During the closing conference, employers should produce any records to show compliance efforts with OSHA
- standards, such as written safety programs, training logs, etc.
- Any effort to show good faith compliance can help to reduce proposed penalties. **That is why it is imperative that you contact Brianna Kline 412.370.1733 as soon as an OSHA Officer arrives on site. No exceptions.**

The Interview Process

Questions the “Competent Person” Should Be Prepared to Answer:

- Is there a competent person onsite? OSHA will begin by determining if there is a competent person present as defined by the standard. The competent person should be prepared to discuss OSHA’s excavation standard.

- Did the competent person inspect the excavation, adjacent areas, and protective systems each day before the start of work, as needed throughout the shift, and after every rainstorm? Is there documentation of the minimum daily excavation inspection?

- Does the competent person have a copy of the tabulated data onsite? Manufacturer's tabulated data must be kept on site for each box or shoring system in each use.

- What is the soil type? How was the soil type determined? The compliance officer will take a soil sample using a penetrometer.

- Did the competent person monitor other types of trench-related hazards that can occur such as falls from the edge, rigging hazards, or toxic-combustible gases?

- Is there a ladder in the trench if it is more than 4ft.?

- Are there adequate means of access and egress? The officer will check that ladders are never more than 25 ft. away from any worker in the trench.

- Is the cut, cavity or depression a trench or an excavation? Is it more than 4 ft. deep? Does it contain water?

- Is there shoring or shielding at 5ft. or deeper?

- Does the trenching or excavation work require sloping, shoring or shielding? How was the protection type determined?

- If shielding is used, does the shield extend at least 18 inches above the surrounding area if it is sloped towards the excavation? Is the depth of the cut more than 2ft. below the bottom of the shield?

- Are there surface encumbrances or exposure to vehicular traffic? Are adjacent structures stabilized?

- Is equipment operating near the trench or excavation? Does the equipment have warning systems?

- Is emergency rescue equipment required?

- Spoil piles at least 2ft. from the edge?

- If the excavation is deeper than 20 ft., the compliance officer will be looking for a plan approved by a registered professional engineer.

CASPER COLOSIMO & SON, INC.

CCSI

PITTSBURGH, PA

Vendors

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Pittsburgh

Trench Shoring Services

Contact: Ken Paytas

Phone: 412-331-8118

Address: 1200 Neville Road Pittsburgh, PA 15225

Website: http://shoring.com

Products / Services Provided:

- Shoring Boxes (Metal / Steel / Aluminum)
- Lifting Harnesses
- Spreaders & Spreader Feet
- Delivery & Pickup

Prospan Shoring

Phone: 1-630-860-1930

Address: 540 Meyer Road Bensenville, IL 60106

Website/ Tabulated Data: www.prospanshoring.com

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Products / Services Provided:

- All Pneumatic Shoring
- Four Sizes of Shoring (Pro-1 thru Pro-4)
- Wale Plates
- Swivel Ends
- Air Hose
- Push Button Trigger Assemblies

Please contact Darrell Gudenburr to place an order request.

Knickerbocker Russel Co.

Phone: 412-494-9233

Address: 4759 Campbells Run Road Pittsburgh Pa 15205

Products / Services Provided:

- Screw Jacks
- Redboard

Please contact Darrell Gudenburr to place an order request.

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

United Rental

Shoring & Steel Plate Contact: Zack Hritz

Zack Hritz's Phone Number: 412-944-3210

All Other Contact: Bryan Wallace

Bryan Wallace's Phone Number: 412-760-1750

Products / Services Provided:

- Shoring Boxes
- Redboard
- Steel Plates

Virginia

National Trench Safety

Contact: Pat Hewitt

Cell: 703- 687-2797

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Maryland

Paradigm Equipment Sales, Inc.
Cell: 410-365-6993
Office: 410-477-1923

Sunbelt Rentals
Office: 301-470-2841

Trench Tech, Inc.
Contact: Troy Cassady
Cell: 240-344-0728
Office: 1-800-443-6832

United Rental
Contact: Kyle McCarty
Cell: 410-242-4504

CASPER COLOSIMO & SON, INC.
CCSI
PITTSBURGH, PA

Contact List

Brianna Kline, MS, MA, CSP, SPHR

Chief Risk Officer

412-370-1733

bkline@caspercol.com

Christo Salimbene, CSP, CHST

Safety Manager

412-737-2561

csalimbene@caspercol.com

Lani McCormick, GSP

Environmental Health and Safety Specialist

412-523-1726

lmccormick@caspercol.com

Darrell Gudenburr

Purchasing Manager

724-355-2776

dtrain@caspercol.com

Jane Peregoy

Project Manager / Safety Manager

443-618-7333

janep@caspercol.com

Back of Page 112
Blank

Inside Back Cover
Blank

Back Cover
Blank