EXCAVATING AND SHORING GUIDELINES

WHAT'S AT STAKE?

Excavation work generally means work involving the removal of soil or rock from a site to form an open face, hole or cavity, using tools, machinery or explosives.

Excavation work can occur anywhere, including:

- on construction sites
- on business premises
- in public areas.

It is mandatory that any trench or excavation more than 1.2 m (4 feet) is properly sloped or shored to comply with the occupational health and safety regulations. No employee shall enter any trench or excavation that is not properly sloped or shored.

WHAT'S THE DANGER?

EXCAVATION HAZARDS

The main hazards associated with excavation work include:

- Surface encumbrances.
- Excavation collapse.
- Loose rock or soil.
- Contact with underground services and/or overhead power lines.
- Falling loads - Materials falling onto people working in the excavation.
- Mobile equipment - People and vehicles falling into the excavation.
- Vehicular traffic - People being struck by plant machines.
- Undermining of nearby structures.
- Access/egress to/from excavation.
- Hazardous atmospheres.
- Ground wáter.
- Accidents to members of the public.

TRENCHING / SHORING

One of the most dangerous forms of construction work is the excavation labor involved with trenching and shoring.

Thousands of employees are injured each year performing this type of work, and hundreds are killed. In fact, the fatality rate for trenching is twice that of deaths incurred from other forms of construction.

The reason for this high mortality rate is the danger involved with cave-ins while on the job. Cave-ins can result from many shifts in the earth that occur during the trenching and shoring process. For example:

- The addition or removal of water
- Vibrations from the excavation
- Added or reduced weight of soil or adjacent structures
- Reduction in frictional forces
- Any amount of freezing or thawing

Once these cave-ins occur, death can result instantly or workers can become trapped and be severely injured or suffer from asphyxiation.

As a result of these risks, it is vital that proper safety precautions be taken before proceeding with a trenching and shoring endeavor.

HOW TO PROTECT YOURSELF

PROCEDURE BEFORE EXCAVATION WORK

- Investigate if a dangerous atmosphere is present or liable to be present?
- See is the space adequately ventilated to maintain adequate oxygen content and prevent the accumulation of harmful substances?
- Find out what the use and history of the location of work is when carrying out risk assessment. Buried underground pipe work or a leakage in sewage system may present a hidden hazard.
- Investigate if a dangerous atmosphere is potentially present; the excavation must be treated as a confined space.
- A safe system of work must be developed and put in place, including the making of appropriate emergency arrangements. The safe system of work may involve the provision of adequate ventilation, testing of atmosphere, or other precautions, as devised by a competent person.

Ongoing Safety Requirements

Throughout your trenching and shoring project it is vital that you ensure:

- Employees wear proper protective Equipment.
- Inspections are conducted prior to each work shift.
- All spoilage is at least two feet from trench edges.
- Employees do not travel under elevated loads.
- And there are trench exits within 25 feet of workers who are in trenches more than 4 feet deep.

Be Aware of Your Environment

Be aware of all the different external factors (aside from the terrain itself) that could pose danger to your employees, such as:

- Foot and vehicle traffic in the area, likes cars and pedestrians.
- Surface hindrances, like telephone posts, fencing, and electrical boxes.
- Underground installations, like utility lines.
- Hazardous atmospheres, like areas that are flammable or oxygen deficient.

Shoring Types

Shoring is the provision of a support system for trench faces used to prevent movement of soil, underground utilities, roadways, and foundations. Shoring or shielding is used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. Shoring systems consist of posts, wales, struts, and sheeting. **There are two basic types of shoring, timber and aluminum hydraulic.**

Hydraulic Shoring

The trend today is toward the use of hydraulic shoring, a prefabricated strut and/or wale system manufactured of aluminum or steel. Hydraulic shoring provides a critical safety advantage over timber shoring because workers do not have to enter the trench to install or remove hydraulic shoring. Other advantages of most hydraulic systems are that they:

- Are light enough to be installed by one worker
- Are gauge-regulated to ensure even distribution of pressure along the trench line
- Can have their trench faces "preloaded" to use the soil's natural cohesion to prevent

- movement
- Can be adapted easily to various trench depths and widths

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 any other damaged or defective parts.

Pneumatic Shoring

Works in a manner similar to hydraulic shoring. The primary difference is that pneumatic shoring uses air pressure in place of hydraulic pressure. **A disadvantage to the use of pneumatic shoring is that an air compressor must be on site.**

Screw Jacks

Screw jack systems differ from hydraulic and pneumatic systems in that the struts of a screw jack system must be adjusted manually. This creates a hazard because the worker is required to be in the trench in order to adjust the strut. In addition, uniform "preloading" cannot be achieved with screw jacks, and their weight creates handling difficulties.

SHORING PARTICULARS INSPECTIONS

Inspection Items That Should Be Considered When Inspecting Shoring:

- Is the installation as per the design?
- Is the soil and water as per design?
- Is there ingress of water?
- Are there proper sumps?
- Is material being drawn from behind the sheets?
- What are the deflections on frames and sheets?
- What is soil composition, are there tension cracks?
- Are the deflections excessive?
- Is there damage to the system?
- Is access to trench adequate?
- Are there any surcharges?
- Check for cracks in adjacent structures?

EXCAVATION PRECAUTIONS

Protect Workers By

According to the Construction Regulations, precautions must be taken that are adequate to:

- Guard against danger to persons at work from a fall or dislodgement of earth, rock or other material by suitable shoring or otherwise
- Guard against dangers arising from the fall of materials or objects or the inrush of water into the excavation, shaft, earthworks, underground works or tunnel
- Secure adequate ventilation at all workplaces so as to maintain an atmosphere fit for respiration and to limit any fumes, gases, vapours, dust or other impurities to levels which are not dangerous or injurious to health
- Enable persons at work to reach safety in the event of fire or an inrush of water or materials
- Avoid risk to persons at work arising from possible underground dangers such as underground cables or other distribution systems, the circulation of fluids or the presence of pockets of gas, by undertaking appropriate investigations to locate them before excavation begins

- Ensure that a safe means of access to and egress from each excavation

Measures to prevent materials falling onto workers in excavations

- Do not store spoil or other materials close to the sides of excavations. The spoil may fall into the excavation and the extra loading will make the sides more prone to collapse.
- Make sure the edges of the excavation are protected against falling materials. Provide toe boards where necessary.
- Always wear a hard hat when working in excavations.
- In rock cut excavations where the rock is friable, netting should be used.

Measures to prevent people and vehicles falling into the excavation

- Fence off all excavations in public places to prevent pedestrians and vehicles falling into them.
- Where children might get onto a site out of hours precautions should be taken such as backfilling or securely covering excavations.
- If possible excavations in public roads or streets should be backfilled or covered over at night to minimise the risk of accidents to the public.
- Do not leave materials lying beside the area of work if not required for imminent use beside the excavation.

If underground cables or overhead lines cannot be diverted, then the following steps should be taken to avoid contact:

- Contact the appropriate service providers (ESB, Bord Gáis, etc.) and ask their advice.
- Look around for obvious signs of underground services, e.g. valve covers or patching of the road surface.
- Use locator's to trace any services and mark the ground accordingly. Make sure persons using these scanners are trained and understand their use.
- Make sure that the person supervising excavation work has service plans and knows how to use them.
- Everyone carrying out the work should know about safe digging practices and emergency procedures.
- Survey the area for overhead obstructions such as electricity lines.
- Erect goal posts and bunting if/as required
- Where work needs to be carried out in close proximity to overhead lines, contact the ESB for advice.

CAVE – INS

Employers can help reduce injuries and fatalities caused by cave-ins. 10 safety tips that will allow crews to work safer.

1. Never enter an unprotected trench.
2. Park heavy equipment as far from trench edges as possible. Keep soil or other materials at least two feet away from the sides of the trench. If the job site does not allow for two feet of distance, soil removed from the trench may need to be moved to another location until work is completed.
3. Find out where utilities are located underground before crews start digging.
4. Inspect trenches daily before work begins and after storms or other events that may cause changes to the trench. OSHA requires that these inspections are completed by a 'competent person,' someone with the knowledge to identify

hazards in and around the excavation and who has the authority to promptly correct those hazards.

5. When exposed to traffic, workers can prevent accidents by wearing highly visible clothing such as **traffic safety vests**.

6. Educate workers on the dangers involved in excavation and on proper safety precautions. An affordable way to ensure workers receive thorough information is to use **training videos and DVDs**.

7. Never work beneath suspended loads of materials.

8. When the trench is more than four feet deep, test atmospheric conditions before work begins. If tests reveal low oxygen, toxic gases, or hazardous fumes, no one should enter the trench.

9. Create systems to protect workers and prevent collapses. Some of the most common and effective protective systems include:

    - Benching – Building steps into the sides of an excavation
    - Sloping – Angling the trench wall away from the excavation
    - Shoring – Installing supports such as aluminum hydraulics to prevent soil movement
    - Shielding – Protecting workers with trench boxes or other protective equipment

Many factors should be considered when designing trench systems, including the qualities of the soil, changes caused by weather or climate, materials that were taken out of or will be put into the trench, or other projects nearby. Planning and implementation of these systems should be done by a competent person.

10. Provide safe entrances and exits to the trench. OSHA requires that ladders, steps, or ramps be used whenever a trench or excavation is more than four feet deep and that all employees work within 25 feet of these provisions at all times. When using ladders, they must extend a minimum of 3 feet above the surface of the trench.

FINAL WORD

Employers can help prevent injuries and deaths by frequently reminding workers of these guidelines and posting signs that stress the dangers of excavation. These warnings could be the difference between good and bad decision-making on the job site.

QUIZ

1. **Shoring is a mechanical system that provides support to the sidewalls of an excavation or trench. The system must conform to the occupational health and safety regulations or designed by a Prof. Engineer.**

   - True
   - False

2. **The advantage of using a pneumatic shoring is that an air compressor does not have to be on site.**

   - True
   - False

3. **A trench is an excavation less than 3.7m (12 feet) wide at the bottom, over 1.2 m (4 feet) deep and of any length.**

   - True
   - False

4. **Timber shoring provides a critical safety advantage over hydraulic shoring because workers do not have to enter the trench to install or remove timber shoring.**

   - True
   - False

WHAT WOULD YOU DO?

You have been doing trench work for a longtime. The trench has been dug at your site supported by hydraulic shoring system. You asked the lead foreman if hydraulic system has been checked for leaking hoses, or other defective parts of the system for your shift. Your supervisor replies that not necessary because the system is new and has been operating at 100% for the past few days. He said it was a waste of time to do it. You disagree and say the system should be inspected once per shift. Do you go down the trench, reach out to a superior, and continue the argument at the risk of being terminated?

What would you do?

BEFORE THE TALK - TIPS

Before the Meeting Preparation Tips

- Pass around the attendance sheets.

Be prepared to discuss:

- Safe work practices and polices passed around pertaining to Excavating and Shoring Guidelines protocols and programs industry - wide and at your location.
- Proper reporting procedures relating to accidents, injuries, illnesses, fatalities, near misses / close calls including hazards and concerns at your location.

Other:

- Conduct a walk around the jobsite and get a first-hand look at the excavation and shoring safety regimen before the safety talk meeting.
- Ask the participants what safety recommendations they think should be installed in the excavation and shoring operations at the job site and invite a Q and A on their proposals.
- Invite to the meeting an employee who suffered injury and illness as a result of excavation and trench work to tell the narrative including answering questions from the attendees.

AFTER THE TALK- *CHECKLIST*

PROVIDED FOLLOW-UP TO WORKERS THAT DID

POORLY ON THE QUIZ
NAME: _____
_____
DATE: _____

OBSERVED WORKERS
TASK(S): _____
_____
DATE: _____

REFRESHER TRAINING
TOPIC(S): _____
_____
DATE: _____

OTHER (DESCRIBE): _____
MEETING DATE: _____
LOCATION: _____

NOTES

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ANSWERS:

1. True

2. False

3. True

4. False

ATTENDANCE

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INSTRUCTOR: _____ **DATE:** _____

SAFETY TALK: _____