

EXCAVATING AND SHORING



This education program provides a guideline for proper excavating and shoring. It is intended to give contractors and workers practical information regarding proper excavating and shoring techniques.

This education program contains general information. For specific regulatory requirements, please consult the appropriate Regulation adopted under the Workplace Safety and Health Act and the Canadian Safety Association Standards (CSA).

INTRODUCTION

Serious injuries and fatalities to workers continue to occur in the excavation industry. It seems that both employers and workers often forget that when they remove earth from the ground, they are creating a situation where extreme pressures may be generated at the face of an excavation.

When you remove the earth, there is no longer material available to support the walls of the excavation – engineering controls must be utilized to provide a safe and healthy workplace within any excavation.

IT'S THE LAW

The Manitoba government has recently (February 2007) changed its laws regarding excavations and trenching. It must be pointed out that every company or sub-contractor on any construction site is classified as an “employer” under the Workplace Safety Health Act & Regulation and have the same legal duties and responsibilities. In a nutshell, employers must ensure the safety and health of their workers and ensure that their actions (or lack of action) do not cause anyone else harm.

By law, Manitoba Legislation requires all excavation or trenching activity to be conducted by a “Registered Excavator”.

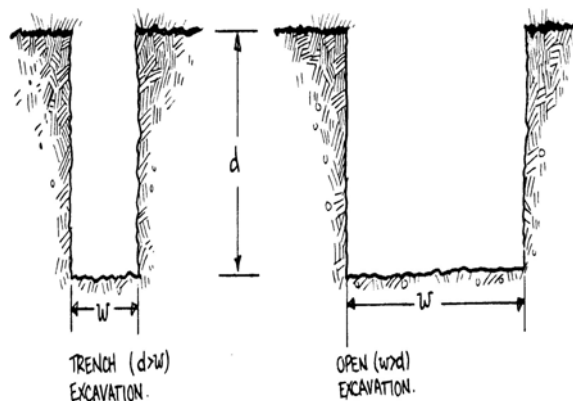
Plus, before doing any digging, **all utilities must have been notified** and the accurate location of all underground facilities have been determined – including gas, oil, steam, water, sewer, communication and electrical.

Further, it is mandatory that a company notify the WSH Division **48 hours prior** to beginning any excavation that is going to be:

- **Trench excavation exceeding 1.5 metres**
- **Any other excavation exceeding 1.5 metres.**

If workers are required to enter the trench or excavation, the employer MUST ensure:

- **45 degree CUT BACK** or
- **SHORING** is required or
- **TRENCH CAGE** is required



SAFETY TRAINING OF EXCAVATION WORKERS

Workplace Safety & Health Regulation 217/2006 26.2 (1)

An employer must:

- (a) develop and implement safe work procedures for the work to be done at an excavation, including the installation, use and removal of shoring;
- (b) train workers in the safe work procedures; and
- (c) ensure that workers comply with the safe work procedures.

Training must be done prior to a worker doing excavation work. This must include but not be limited to:

Hazards involving heavy equipment near excavations:

1. If possible, plan for drive-through areas – reduces need for back-up.
2. Make personnel familiar with blind spots on equipment.
3. If required, use spotters.

Soil conditions when excavating:

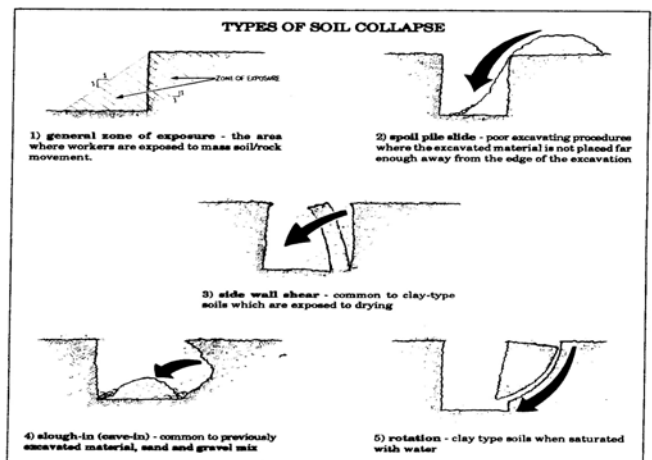
1. Be aware of moisture content and soil changes when excavating.
2. Dealing with different types of soil types – hard ground, clay, granular material, wet clay, organic deposits with high moisture content.

Three Main Type

#1 Stiff and Firm Soils – solid soils with substantial cohesion and no water table present (good clay, stiff clay till, medium till).

#2 Soils likely to crack or crumble – soils that can be excavated by hand tools, show signs of cracking after excavating, and possess a low medium moisture content (heavily seamed silty clays, compacted clayey fill, and mixtures of clays and silts).

#3 Soft and loose soils – soils easily excavated by hand with little or no cohesion (i.e. sand, gravel, silt, organic soil, soft and wet clay and loose fill).



Methods of protecting workers against cave-ins: methods are:

1. Sloping
2. Shoring
3. Trench boxes (support structure)

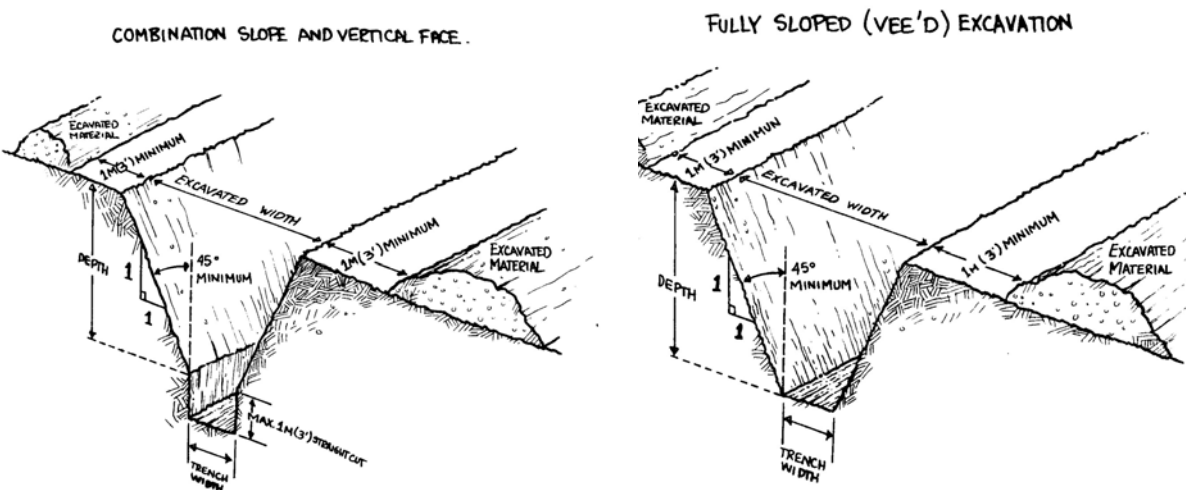
Since 1995 twenty-eight workers have died in unprotected excavations. These workers ranged in experience from two days to twenty-nine years and ranged in age from sixteen to sixty-one years. **One thing all these fatalities had in common – EACH WORKER THOUGHT HE WAS SAFE.**

Cave-ins happen unexpectedly, a common occurrence is wall failure. The dirt slides into the trench / excavation pinning the worker. It may not seem like it, but dirt is very heavy and only two feet is about 700 lbs. So even if a worker's face and shoulders are exposed he will not be able to breathe.

SLOPING OF TRENCH / EXCAVATION WALLS (WSH Regulation 26.15(1))

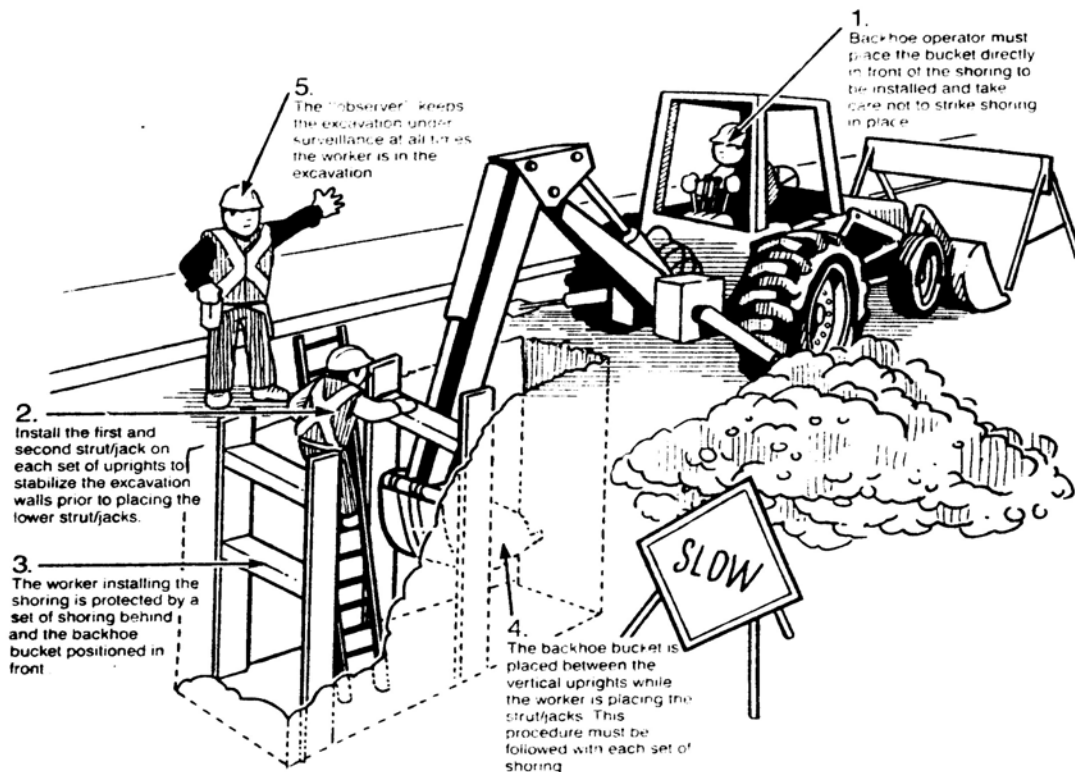
If a worker is required or permitted to enter an excavation that is more than 1.5 m deep, an employer must ensure that a support structure is installed in the excavation, unless:

- a) the excavation is cut in solid rock or other equally stable material, excluding frozen ground;
- b) the walls of the excavation are sloped at an angle not greater than 45° measured from the horizontal plane; or
- c) a combination of slope and vertical face is used for stabilizing the walls of the excavation where the vertical face is not more than one metre high and the remaining walls are sloped at an angle not greater than 45° measured from the horizontal plane.



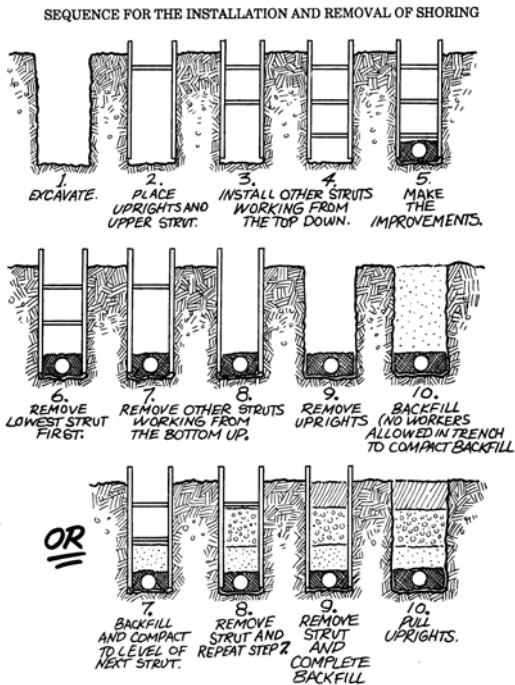
PROPER SHORING PROCEDURES (WSH Regulation 217/2006)

An employer must ensure that shoring is installed from the top to the bottom of an excavation in descending order and removed in the reverse order from which it was installed.

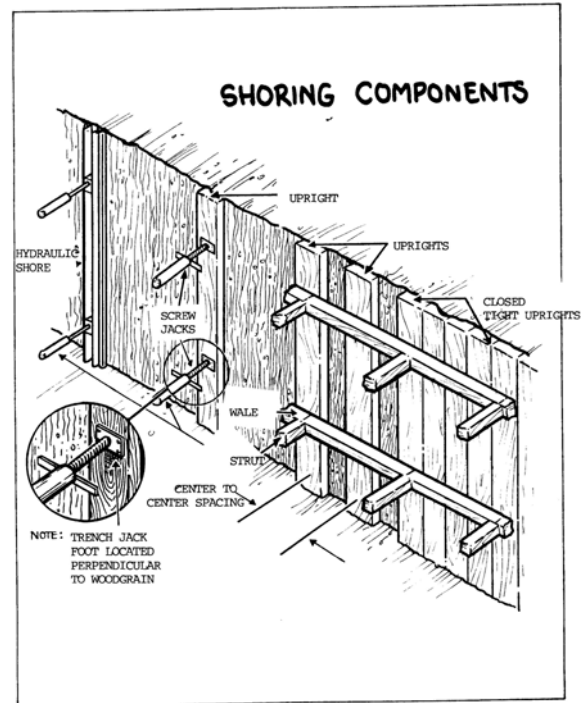


- When installing shoring within a trench-type excavation, proper methods and procedures must be followed to provide for a safe excavation.
- When shoring is in progress, the bucket of the excavation machine must be placed in the trench directly in front of the shoring being installed. The bucket will serve as additional protection if a cave-in occurs.
- As the diagram on the opposite page shows, **it is essential that shoring struts/jacks be installed from the top down.** It is important that the top (first) strut/jack be placed approximately .5 meters (18") below the surface, then the second strut/jack placed according to the shoring table. The installation of the first and second strut/jack to support the vertical uprights is very important as it stabilizes the excavation walls.
- When removing shoring, the reverse procedure is used. That is, the struts are removed from the bottom to the top. Remember, there must never be less than two sets of uprights in place and the worker must always remain within the shoring in place for protection.
- It is preferable to have the worker who installed the struts to be the one who removes them. That worker will know if there has been a change in conditions, undue pressure on struts or other potentially dangerous conditions.

SEQUENCE FOR THE INSTALLATION AND REMOVAL OF SHORING



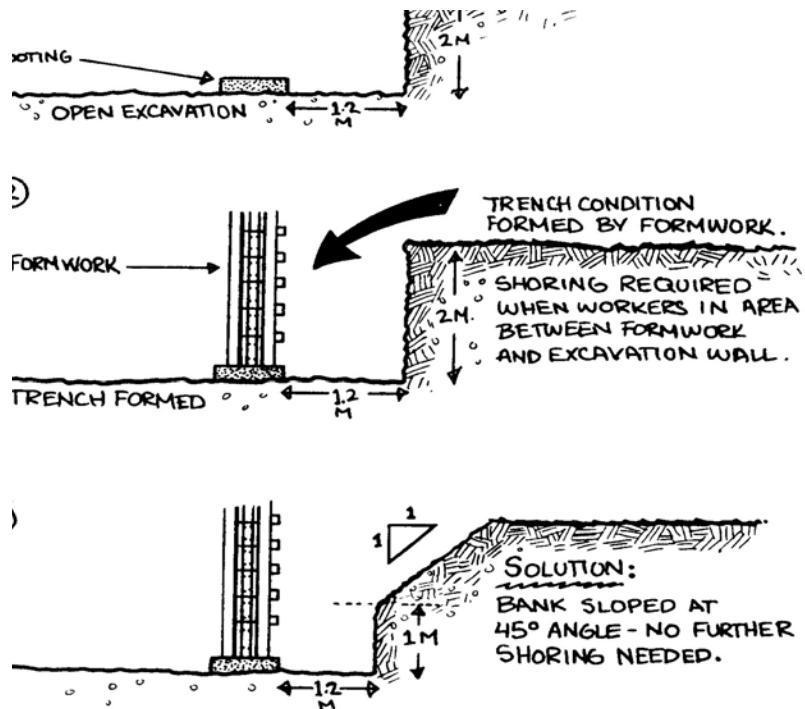
SHORING COMPONENTS



CAUTION

An open excavation may become a trench excavation as the project proceeds.

As example, a concrete foundation or basement wall constructed in an open excavation 1.5 meters (5 ft.) deep, now creates a trench condition and would now requires shoring or veeing-out if workers are required to work on the outside wall between the concrete and the earth.



SUPPORT STRUCTURE (Trench Cage)

- If an adjacent building, foundation or other structure may be affected by an excavation, ensure that, before any work on the excavation begins, the building, foundation or other structure is supported by a **support structure that is designed and certified by a professional engineer and constructed, installed, used and dismantled in accordance with the professional engineer's specifications.**
- An excavation that is more than **3 m deep**, a support structure is installed in the excavation that is designed and certified and constructed, installed, used, maintained and dismantled in accordance with the professional engineer's specifications.
- Specifications for a support structure address the following matters:
 - a) the size and specifications of the structure, including the type and grade of materials used in its construction;
 - b) the loads and types of soil conditions for which the structure is designed;
 - c) the installation, use and dismantling instructions.
- Must ensure that the structure is inspected and certified by a professional engineer immediately after the installation of the structure has been completed.
- If a safety and health officer is of the opinion that the support structure may create a risk to the safety or health of a worker; or there is a change in ground stability in the excavation in which the support structure has been installed an inspection is required by an engineer.
- If an inspection results in a recommendation that the support structure be redesigned.
- Installs of re-shoring into an excavation.
- Where a trench cage is to be constructed and used.
- Where a trench gage is used for stacking.
- For all deep foundations.
- A hoist designed and certified for deep foundation excavation.

ADDITIONAL Safe Work Practices

- **NEVER** leave an excavation or trench unprotected.
- All excavations / trenches where the public has access must have barriers and signage to protect workers and the public from the hazards during the work hours and off hours.
- Workers must be wearing the proper Personal Protective Equipment (PPE) such as a hardhat, safety footwear, safety eyewear, hearing protection, and fall protection as required.
- Ladders must be installed in an excavation greater than 1.2 metres - secured and extend at least three rungs above ground level (1metre or 3ft).
- In a trench excavation a ladder must be located within 3 meters (10 ft.) of a worker's working position.
- Any crossover of an excavation must have a proper walkway with suitable guardrails.
- Never use pointed tools to probe for underground gas and electrical services. Shovels are recommended.
- All work materials should be a least two meters back from the edge of the excavation.
- The spoil pile must be placed at least one meter away from the edge of the excavation.
- Before approaching the excavation site workers should make eye contact with equipment operators.
- Ensure a first aider and first aid supplies are available at the excavation project at all times.
- Workers much receive WHMIS training and MSDS (Material Safety Data Sheet) must be on site.
- Supervisor must be a trained excavator.

EXCAVATION AND SHORING

REVIEW QUESTIONS

NAME _____

DATE _____

- T / F 1. You can predict if an excavation is safe to enter without a proper support structure being provided.
- T / F 2. Water helps in controlling the soil of a trench.
- T / F 3. An excavation should be considered a confined space and appropriate evaluation and controls undertaken to ensure workers are not exposed to contaminated atmosphere.
- T / F 4. Clay is easier to handle when dried by the sun.
- T / F 5. You do not have to call the public utility if hydro lines are overhead.
- T / F 6. You can enter an unprotected trench if you are only going to be in it for a short period of time and a ladder is in place.
- T / F 7. If the soil is frozen, shoring is not required.
- T / F 8. The supervisor is the only person allowed into an unprotected trench.
- T / F 9. Struts are removed from the top down.
- T / F 10. The minimum distance between the edge of the trench and the excavated material is 3 feet.
- T / F 11. Worker training is done onsite.
- T / F 12. You must register as an excavating contractor with the City or Municipality.