Excavation Safety Handbook
FOR EMERGENCY RESPONDERS

GT SWCA
Greater Toronto Sewer & Watermain Contractors Association
# Table of Contents

- Safety Checklist .............................................................................. 4
- Purpose of this Handbook ........................................................... 6
- Reference Guide for Common Excavation Types ..................... 8
- Additional reference points on an excavation jobsite ............. 18
- Top 5 Facts you need to know about an excavation construction site .......................................................... 21
- Provincial Regulations Guiding Excavations ......................... 22
- Emergency Planning on our Sites ............................................... 24
- Common Terms / Definitions ..................................................... 26
Safe Excavation Construction Site Checklist

Trench Collapse

Follow training protocol

Why have I been called to this worksite?

Utilize checklist to expedite injury response

Injury / Illness at the worksite (no collapse)

1. Identify the Site Supervisor for a situational debrief.
2. Confirm the nature of the emergency.
3. Visually, does the excavation match what the supervisor is saying?
4. Confirm with site supervisor the appropriate access and egress into/out of the excavation or shoring system.
5. Confirm with supervisor how to get injured worker(s) in and out.
6. Determine what resources are needed for a safe rescue.
   a. Available on-site
   b. Required from off-site
The handbook has been designed to provide the emergency responders with a simple to use reference guide, to assist in coping with an emergency response situation where an excavation is involved.

Its intent is to familiarize EMS responders with safety precautions that construction employers must take according to the Occupational Health and Safety Act (OHSA) and regulations, such that the emergency responders can have confidence in the stability of the excavations that they may need to access.

Provincial OHSA regulations provide for three means by which an employer can maintain a safe excavation: 1) appropriate sloping; 2) installation of shoring systems; and, 3) installation of a protective shield or barrier system.

Purpose of this Guidelines Manual

The intent of this manual is to assist in the EMS responses to injuries in or around an excavation operation. It is NOT intended to provide guidance for a rescue operation as a result of a trench/shaft collapse, or atmospheric hazard.
Reference Guide for Common Excavation Types

As noted throughout this document, there are many different types of excavation work and techniques, all of which serve their own individual purposes and are utilized at different times. OHSA regulations do not always require the installation and use of a support system. There are instances—including excavations into stable rock, those of less than 1.2 meters in depth, and when the excavation walls may be sloped in such a manner that it will prevent collapse—where support systems are simply unnecessary.

Typically, excavations can be grouped into three primary categories:

1) Caisson Walls / Tunnel Shafts / Hydraulic Bracing Systems.
2) Trench Boxes / Shields.
3) Sloping / Excavation into Stable Rock.

Included are a number of photographic examples of these common excavation types to serve as a guideline for what a safe excavation site may look like.
1. Caisson Walls / Tunnel Shafts / Hydraulic Bracing Systems

Caisson Wall

A Caisson Wall is composed of a series of vertically drilled holes which then filled with concrete and are interlocked to form a concrete wall.

Tunnel Shaft

A Tunnel Shaft is a vertical opening designed by an engineer and may be a caisson wall or an engineered support system. Shafts are used for supplying equipment, personnel, and support systems to a horizontal tunnel excavation.
Hydraulic Shoring

Hydraulic shoring products are designed to prevent excavation cave-ins from happening by exerting pressure back onto the walls greater than that trying to collapse them. They are a simple and safe way to shore a trench being dug into stable soil. They can be placed as fast as you excavate.

Slide Rail / Hydraulic Brace System / Engineered Support System

Slide Rail is modular, dig and push style component shoring system that allows contractors to push the system in place while digging the excavation to depth. Hydraulic brace systems are adjusted hydraulically in multi-sided excavations.
2. Trench Box / Shields

Trench Box

A trench box is designed as a worker protection system and is used to allow the sides of an excavation to be cut vertical or near vertical which ensures ground stability and to minimize the excavation area.

3. Sloping / Excavation into Stable Rock

Excavation into Stable Rock

An additional shoring system is not always necessary during an excavation, such as when one occurs into solid, stable rock as per the picture below.
Sloping
Additional shoring is also unnecessary during digs into particular types of soil, where the excavation may be sloped as determined by a professional engineer and according to provincial construction regulations.

Combined
Combined is a mixture of two excavation shoring types. Typically, this involves the use of a bracing system at the bottom of the excavation, while the top walls are sloped.
Additional reference points on an excavation jobsite

Safe Access and Egress Points

Included below are common examples of access and egress into an excavation. There are many other common and acceptable approaches as well.

Dewatering and Sewer Bypass

Construction dewatering is the removal or draining of groundwater or surface water from a construction site. This frequently involves the issue of submersible dewatering pumps, centrifugal pumps, eductors, or the application of vacuum to well points.

Sewer bypass typically occurs during the rehabilitation of existing sewer lines, where the flow of sewage cannot simply be diverted; it must be “bypassed”—or involves temporarily pumping sewage around the pipe being repaired or replaced.
Top 5 Facts You Need to Know about an Excavation Construction Site

1. All shoring systems are designed by professional engineers.

2. How excavations are dug out and braced or supported depends on the type of soil that is being removed, the depth and width of the excavation, and the work activities that will take place in the excavation, all of which is governed by provincial regulations.

3. Each excavation has a specific safety plan developed according to provincial standards and designed specifically for excavations.

4. Under provincial regulations, supervisors are liable for up to $25,000 if they are negligent in their duties on a jobsite (for each charge incurred), while companies are liable for up to $500,000 and can face federal criminal charges for negligent actions.

5. The majority of emergency calls to sewer and watermain construction sites are a result of injuries or medical issues that are sustained on the jobsite that are unrelated to a trench collapse.
Below are the specific requirements for a contractor under the Construction Regulations and Occupational Health and Safety Act. If each of the below items can be reasonably identified, or explained and shown by the site supervisor, then it is reasonable to assume that the excavation site has been designed, constructed, and maintained according to good engineering practices and all provincially regulated codes.

- Remove debris and excavated soil near excavation site, leaving a minimum of one meter clear from the excavation lip [s. 233].
- Section 234-242 of the regulation details all of the specific requirements governing the support systems for excavation, which are manufactured according to these specifications.
- The excavation is being kept reasonably free of water [s. 230].
- Knowing the types of soil and appropriate sloping, shoring or shielding requirements for that soil type, as approved by a professional engineer [s. 226].
- Emergency plans on site [s. 17-18].

In addition to the requirements under the Regulation for Construction Project, there are also a number of provisions that an excavation contractor must follow under the Occupational Health and Safety Act, including:

- Clearly identifiable access and egress point(s) from an excavation using ladders, steps, ramps, or other safe means of entering and exiting.
- Ensuring that the appropriate tools for the job are available.
- Take into account any possible environmental hazards in the excavation (e.g. rain, ice, contaminated soils, sewage effluent, hazardous atmospheres).
- Keep a clear space between equipment and material and the top of the excavation (1 metre).
- Be aware of and limiting the movement of vehicles and mobile equipment near the walls of the excavation.

Ontario Regulation (O.Reg) 213/91 are the Construction Project regulations under the Occupational Health and Safety Act (OHSA), with Part 3 and 4 specifically governing excavations, tunnels, shafts, caissons, and cofferdams. These sections strictly guide how excavations are to be designed, constructed, and maintained, including the required support systems and/or sloping requirements for the excavation walls depending upon the type of soil present.

Any excavation deeper than 4 feet shall be either sloped in accordance with regulations or protected using temporary shoring (examples of typical sloping and temporary shoring are included below in Section 9).

Protective structures must be installed, used, maintained, and dismantled in accordance with the professional engineer’s design. Drawings and instructions must be kept at the site and made available to workers.
Emergency Planning

Beyond the regulated site design prerequisites, Employers on an excavation site are also obligated to be prepared for emergency situations according to Section 17 of O.Reg 213/91. Section 17 requires a contractor to have project-specific written emergency procedures which are posted in a conspicuous place on the project site. In order to meet this requirement, sites are typically over-engineered to protect workers from a “worst-case scenario.”

It must be understood, however, that the vast majority of incidents that occur on an excavation site are unrelated to a “worst-case scenario” (i.e. a collapsed trench). Falling objects and materials, equipment mishaps, illnesses or medical conditions, and slips, trips, and falls result in the overwhelming majority of calls for EMS assistance on an excavation construction site.

In these situation, some of the injuries typically occur due to:

- Non-occupational medical emergency (e.g. heart attack, allergic reaction, etc).
- Occupational illness (e.g. heat stroke, exposure to pollutants, etc).
- Slips, trips, and falls from heights.
- Struck-by incidents (e.g. excavated material or other objects falling on workers).
- Struck-by vehicles or moving equipment.
- Exposure to underground services (e.g. energized electrical cables, etc.) or overhead electrical cables.
- Storage and handling of materials.

The site supervisor is the site expert and should be utilized by EMS workers as such. He/She will have all of the appropriate paperwork and site specific information required under the construction regulations, OHSA, utility locates, etc, as well as any municipal or contract specific information pertaining to the site. The site supervisor should be consulted immediately upon EMS arrival for a debriefing of the incident, how it occurred, and what has been done to expedite the process before EMS workers have arrived on site. The site supervisor should be identified and utilized as a resource for information related to the worksite.
Common Excavation Terms

**Excavation**
Any man-made cavity or depression in the earth (including its walls, floor, and lip) formed by earth removal. An excavation is wider than it is deep.

**Trench**
A narrow excavation which is deeper than it is wide.

**Spoil Pile**
Soil removed from the trench, commonly found on the trench lip required to be at least one metre away.

**Shoring**
Supporting component that resists a compressive force imposed by a load.

**Trench Box**
Free standing shield for the workers.

**Egress**
Entry and exit point of an excavation, required on trenches four feet or greater in depth.

**Toe**
The area where the walls and floor intersect at the bottom of the trench.