



Trenching Safety Best Practices

There were 111 trenching-related deaths in the United States from 2016 to 2020. According to U.S. Department of Labor statistics, “Average annual fatalities in the water and sewer industry quadrupled from an annual average of 2.75 (2011-2014) to an average of 11.0 (2015-2016).” Also, the annual numbers for all industries rose from 90 fatalities between the years of 2012 and 2016, so recent numbers are showing a rise in incidents. Fortunately, TWCA Risk Management Fund members have not experienced these tragedies; however, some members have had cave-ins occur with employees inside the trench. Most of these incidents occurred due to a lack of experience, improper planning, or both. In this article we will discuss best practice methods to help reduce the likelihood of a cave-in and ways to help your employees avoid injury around the trenching jobsite.

A cubic yard of dirt (3’x3’x3’) could weigh as much as one ton. There are many hazards involved with a cave-in; falling debris, blunt force trauma, etc. The biggest danger of a cave-in comes from the sheer weight pressing on your chest. As you breathe out, your lungs deflate, and the weight of the soil reduces how much air you can breathe in with the next breath.

It is important to have a plan. It would be easy to tell employees to go dig a trench and repair the water line but there is a lot more involved than that. Your first priority should be to review your written trenching and excavation program. If you do not have one, this article should serve as a good reminder to begin the process of developing one. Key components of a written program would include identifying a competent person to oversee the entire process, identifying who will operate the backhoe or excavator, analyzing the area and soil where the trench is to be dug, heavy equipment and safety device inspections, the appropriate personal protective equipment to be used by all employees, and the required training for all employees before they can even enter the jobsite.

It is not uncommon for a safety professional or supervisor to shut down trench work due to unsafe conditions. Unfortunately, we work against decades of “This is how we have always done it” and when we come up on a worksite, we see straight line trench walls that exceed four feet of depth with no benching, sloping or presence of a trench box. A trench box, or trench shield, is a square structure made up of pre-constructed side walls and adjustable cross members, usually made of aluminum or steel. They are placed in the trench and reduce the hazard of a cave-in.



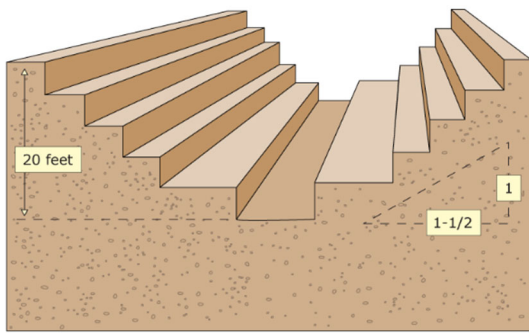
Trench box during water line installation

The unsafe conditions are brought on by making assumptions of the soil conditions. There are three types of soil and they are type A (clay, silty clay, sandy clay), type B (angular gravel, silt) and type C (sand and other granular compositions). Other than solid rock, Type A is the most stable while type C is the least stable. Now many of us are not geologists so it is best to presume that the soil is some form of type C. By doing so, we approach the work with a heightened awareness that the soil is unstable, and a collapse is imminent.

Above, trenches exceeding four feet of depth are mentioned. In most cases, this is the cutoff for straight line trench walls. It also depends on the type of work we are doing. If the employees are crouching down to perform work towards the bottom of the trench, they could become trapped due to a cave-in. For this reason, it is important to understand the type of work being performed and adjust your depth standards for benching and sloping accordingly.



Sloping involves digging the trench walls at a ratio of 1.5 to 1 or approximately 34° for a Type C soil, 1 to 1 ratio or 45° for Type B soils and a .75 to 1 ratio or 53° for Type A soils. By doing this you reduce the risk of a collapse but also improve the likelihood that the employees can easily escape in the opposite direction. The openness also provides the employees room to move around easier. The total depth should not exceed 20 feet.



Benching is very similar to sloping except for the benching look that gives it the name. As you can see in the illustration, the first bench closest to the bottom of the trench is wider than the others. As a best practice, the vertical height of each bench should not exceed four feet and the total depth of the trench should not exceed 20 feet. Benching can only be performed for Type A and B soils.

In addition to ensuring the trench walls are safe from collapse, it is important to monitor the conditions of the trench throughout the duration of work being performed. Water should not be allowed to enter or build up in the trench as this will loosen and move dirt about around the employees. If this happens, all employees should be removed from the trench until normal conditions can be restored. Additionally, work should be halted when it begins to rain and kept from resuming until a competent person can ensure the conditions are safe to continue the work.

Vibration and extra weight can also contribute to a trench wall collapse. Therefore, all heavy equipment should be kept away from the edge of the trench. All spoil from the trench should also be piled away from the edge by at least two to three feet.

When it comes to the overall safety of all employees around the worksite, it is very important to remember the common causes of injuries, slips, trips, falls, struck by, strains and sprains. To safeguard against these hazards, you must ensure that the worksite remains organized, employees are donning the appropriate personal protective equipment (PPE), employees utilize team lifting and the heavy equipment operator always has a spotter to warn of electrical wires or unseen employees nearby. Keeping the worksite organized will reduce trip hazards. It is also important to have a ladder or other means of egress every 25 feet. Donning the appropriate PPE (gloves, hard hat, safety glasses and high visibility safety vests) will create a layer that could protect employees from cuts, flying debris in their eyes and falling materials from above. The high visibility vest will make the employees more visible, so they are not inadvertently hit by the boom or bucket of the backhoe or excavator.

Trenching is a necessary task for TWCA Risk Management Fund members. Line breaks, new line installation and replacement of older pipelines are common practices throughout the year. There is no guarantee of soil stability when working with a trench. Vibration, moving parts, gravity and other factors can cause a cave-in without warning. Therefore, a best practice of sloping, benching or using a trench box is highly encouraged. These methods greatly reduce the hazard of a cave-in and ensure your employees have a safe environment in which to work.

The TWCA Risk Management Fund Loss Control Consultants would be glad to assist with any questions about trenching safety. Please reach out to your [Loss Control Consultant](#) and we will forward your request to them. Thank you for all that you do and stay safe out there!