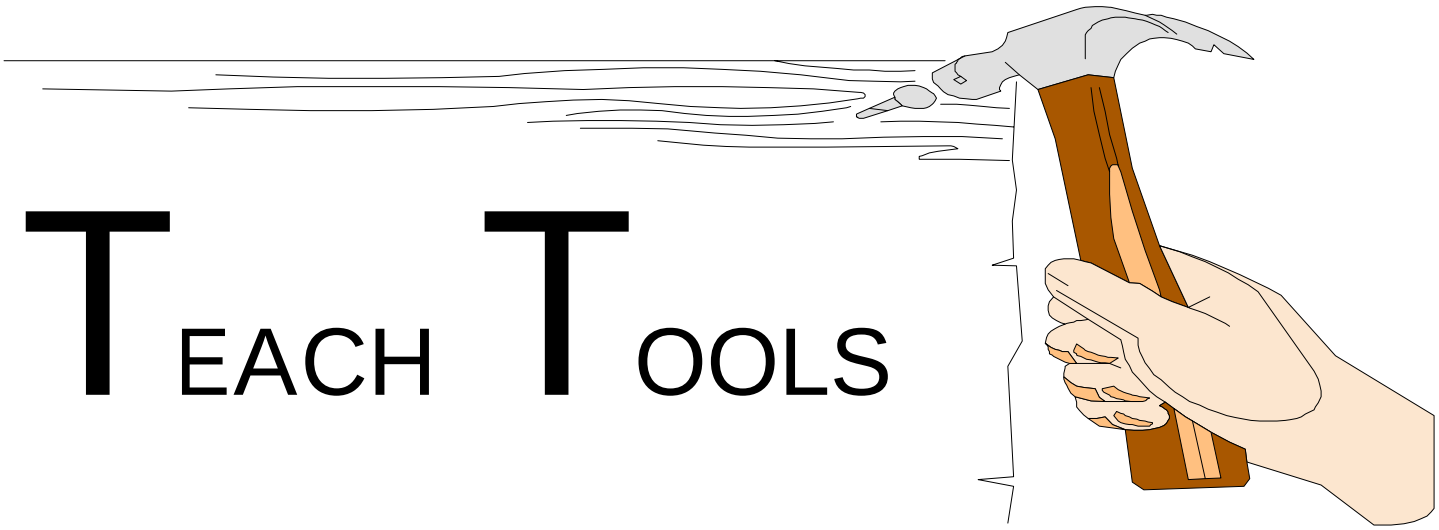

TEACH TOOLS

November 1998

A guide to assist in training employees.

#18 - Trenching and Excavating Safety

provided by:

The Kansas Municipal Insurance Trust

Trenching and Excavating Safety

Meeting Objectives –

To explain the risks of working in or around excavations, as well as the regulations designed to protect workers against cave-ins and other dangers. The result should be greater awareness of the hazards of such work and greater attention to safety measures.

Suggested Materials to Have on Hand –

- Hard hats, sturdy shoes, and other personal protective equipment
- Safety belts and lifelines
- Reflective vests

Introduction/Overview –

Excavating is a normal part of most construction projects. Unfortunately, it's also a particularly hazardous activity.

Trenches used to install or repair gas, sewer, water, and utility lines are especially dangerous. Here are two real examples, reported by OSHA.

1. Two employees were installing PVC pipe in an unsupported trench 40 feet long by 9 feet wide by 2 feet deep. There was a cave-in that killed one employee and seriously injured the other.
2. Employees were laying plastic pipe in an unsupported trench 9 feet deep and 3 feet wide. Water seeped in near the bottom of the trench, causing a cave-in that buried one employee and totally covered two others. All three died.

Both of these examples involved trenches that had no supports. This is a leading cause among excavating accidents and kills at least 100 workers and injures many more every year.

Excavating and trenching are hazardous, but these accidents can be prevented. When we follow regulations and take proper precautions, we can perform our work professionally—and safely.

General Hazards –

Cave-ins are the most serious, frightening, and deadly excavating and trenching hazard. It's not the size of the hole that's the problem, most deaths occur in excavations just 5 to 14 feet deep, it's the risk of being crushed or suffocated. A cubic yard of earth weighs approximately 3,000 pounds—about as much as a car!

Cave-ins aren't the only hazard. There's also a risk of injury or death resulting from:

- Asphyxiation due to lack of oxygen;
- Inhaling toxic substances;
- Fire;
- Drowning;
- Overloads at excavation edges that cause materials to fall or walls to collapse;
- Contacting or cutting underground utility lines; and
- Being hit by machinery or vehicles.

Proper planning and procedures can protect us from these dangers, but they only work if everyone takes their safety responsibilities seriously.

Identifying Hazards –

Before you can avoid hazards, you have to identify them. This is why the regulations for excavating emphasizes pre-work preparation. OSHA urges contractors to identify hazards before even bidding on a job so that safety is built into the planning at an early stage.

Each site has its own special hazards. In order to protect employees, the safety planning has to consider several things.

- Soil type. Different soil types present different hazards and require different types of support.
- Surface and ground water and water table. Water creates a serious hazard in an excavation. When water is a risk, you may need dikes, ditches, or special equipment to keep it out.
- Utilities. To prevent workers from contacting or severing utility lines, employers must try to find out where those lines are. Contractors must let utility companies and property owners know about their work plans and ask them about utility line locations.
- Location and condition of adjacent structures. A registered professional engineer should check nearby buildings, pavement, and other structures. Special supports may be needed to keep those structures stable and protect employees during excavation.
- Traffic. When excavating in roads or other high-traffic sites, employers have to take steps to protect employees from traffic and materials carried in trucks.

An employer uses all that information to design a safety and health program for the particular job. The program spells out how the employer will identify, evaluate, and prevent that job's hazards and potential hazards. It also covers how employees will be trained to recognize hazards and protect against them.

Protection Against Hazards –

Before a job even starts, employers should take steps to protect employees from the identified hazards.

For example, loose rock or soil that could fall into the hole is removed by scaling or keeping it behind barricades or other barriers. There may be additional retaining devices to keep equipment or materials from falling or rolling into the excavation. Employees are also usually directed to keep equipment and materials at least two feet from the edge.

To be sure workers can get in and out of an excavation safely, regulations require steps, ramps, ladders, or other protective equipment, for any excavation four or more feet deep. They must be:

- Sturdy—rock or soil steps are not permitted;
- Used only to get in and out of the hole; and
- Within 25 feet of the work area.

When people or equipment will cross over an excavation, a walkway must be provided for that purpose.

Preventing Cave-ins –

Preventing cave-ins is, of course, the biggest concern. To accomplish that, regulations require the sides of the excavation or trench to be angled or reinforced. You can eliminate that step only if:

- The excavation is entirely in stable rock, or,
- The excavation is less than 5 feet deep and a competent person's investigation finds no indication of cave-in potential.

Regulations detail eight possible ways to keep the sides of a hole from moving or collapsing. The choice depends on soil, water, climate, excavation depth, and other factors that affect the individual job.

Of the eight options, four are ways to slope the sides away from the excavation itself or bench the sides in horizontal steps. The other four options involve supporting the sides with timber, aluminum, or structures known as trench shields or welder's huts. When these supports are used, they must be removed carefully from the bottom up at the end of the job. Then the hole is backfilled.

On some sites, you also need support systems to stabilize buildings, walls, sidewalks, or other structures adjoining the excavation. You almost always need such supports if you're excavating below a foundation or retaining wall footings.

Another pre-work task is to cover or barricade any on-site wells, pits, or other open holes so no one will fall in.

To further reduce the risks of excavation work, the site safety and health program also identifies the personal protective equipment (PPE) employees must use. You may need a hard hat, protective glasses or goggles, sturdy shoes, or other protective safety equipment. If there's traffic around the excavation, you'll also need to wear a reflective or highly visible vest. Anyone who visits the site has to wear those protections, too.

Another safety precaution is to test the excavation's atmosphere for hazardous contaminants and oxygen levels before anyone enters. If there's an oxygen deficiency, or ventilation can't reduce contaminants to safe levels, you'll need a respirator. To promote fast rescues in an emergency, you may also need to wear a harness with a lifeline. Other rescue equipment has to be available at excavations where atmosphere may be hazardous.

Safety Procedures –

All this preparation goes a long way toward preventing accidents in excavations. But it won't take the place of day-to-day, minute-to-minute attention to safety on the job.

Weather and other factors can change hazards. Equipment can fail and people can get careless. That's why a competent person needs to inspect the excavation, its protective systems, and the area around it before each day's work shift. Regulations also require inspections after a rainstorm—or any event that could increase hazards. If the inspection indicates cave-in potential, hazardous atmosphere, protective system failure, or any other danger, exposed employees must leave the area until the site is safe.

When you work in an excavation or trench, you also must take responsibility for your own safety.

- Always wear your assigned PPE, it's your defense against falling objects and other hazards. Remember that you may need a reflective vest around traffic and a respirator if there's a hazardous atmosphere or oxygen deficiency.
- Inspect and maintain PPE carefully. Be sure it's not damaged so it can protect you properly.
- Don't stand or work under loaded lifting or digging equipment. And don't operate the equipment unless you're trained and authorized to do so.
- Do watch out for water. If there's water in, or coming into, an excavation, stay out unless you're protected by a special shield and/or lifeline.
- Watch out for people below when you work on the sides of sloped or benched excavations. You can't work on such sides unless the employees below are well protected from falling, rolling, and sliding material, or equipment.
- Keep materials away from the edges of excavations. Either place materials and equipment at least two feet from the edge, set up a barricade at the edge, or do both.
- When an operator of moving machinery doesn't have a clear view of the edge of an excavation, regulations require barricades, stop logs, or some type of warning system.

Finally, stay on full alert at all times during excavation jobs. Keep an eye out for any conditions that could cause cave-ins, such as cracks, bulges, or signs the ground is moving. Other things to watch out for are ventilation problems or the smell of chemicals. If there's anything that might prove to be a problem, don't take chances. Get out, report it, and don't go back until you're officially notified that it's safe.

Wrap-Up –

We know that excavation sites can be dangerous. For too many people, they have proved deadly. Fortunately, we can eliminate or at least greatly minimize the risks. We need good hazard identification, safety planning, and proper support systems. On the job, we have to use every protective device and procedure and follow all the rules. When lives are at stake, no one can afford to cut corners or skip steps.

Suggested Discussion Questions

1. What are the possible hazards of excavating work?
2. What specific hazard is most likely to cause death and why?
3. What factors are studied in order to plan an excavation safety and health program?
4. What kinds of protective systems are used to prevent excavation cave-ins?
5. What kinds of personal protective equipment might you have to use?
6. What precautions help keep materials from falling into an excavation hole?
7. Why is it important to test the atmosphere in a trench or other excavation?
8. Why do employers contact utility companies before starting excavation?
9. What might you look for if you were doing a daily inspection at an excavation site?
10. Are there any other questions?

Trenching and Excavating Safety Checklist

Follow safety rules to avoid excavation hazards:

- Cave-ins (crushing or smothering)
- Asphyxiation from lack of oxygen
- Illness or death from inhaling toxic substances
- Fire
- Drowning
- Injury or death from falling materials or vehicle/machinery contact
- Electrocution or other injury from utility line contact

Before entering an excavation, be sure that:

- A safety and health program identifies hazards and protections
- Utilities know of excavation plans and help locate lines
- Surface water and runoff are held back by dikes, ditches, or equipment
- Adjacent structures are stable or supported
- The atmosphere was tested for hazardous substances and adequacy of oxygen
- Loose rock or soil was scaled, barricaded, or otherwise held back
- Special steps or other sturdy entry/exit means are within 25 feet of the work area
- Walkways are in place for crossing over an excavation
- Empty wells, pits, etc. are covered or barricaded
- Excavation sides are sloped, benched, shored, or shielded
- A competent person's start-of-shift inspection approved the safety conditions
- Assigned personal protective equipment is undamaged
- Emergency rescue equipment is available on-site if excavations may have hazardous atmosphere.

Take safety precautions to work in or around an excavation:

- Wear assigned personal protective equipment such as hard hats, shoes, safety glasses, etc.
- Wear a respirator and harness with lifeline if there's a hazardous atmosphere or lack of oxygen
- Wear a reflective vest or other high-visibility garment to work in areas with traffic
- Operate equipment only if you're trained and authorized
- Don't stand or work under loaded lifting or digging equipment
- Leave any excavation where water is present or coming in unless you have a special shield and/or lifeline
- Work on sloped or benched excavation sides only if employees below are well protected from falling, rolling, or sliding materials
- Keep all materials at least two feet from the edge of the hole and/or behind a retaining device
- Leave the hole immediately to report cracks, bulges, chemical smells or any other potential dangers