



# Kansas LTAP Fact Sheet

A Service of The University of Kansas Transportation Center for Road & Bridge Agencies

## Safety Tips for Trench Digging

By Mehrdad Givechi

*Several factors affect trench safety.*

**E**xcavation and trenching are among the most hazardous construction operations, with two workers killed every month in trench collapses, according to the federal Occupational Safety and Health Administration (OSHA). Requirements for excavation and trenching operations are covered in OSHA's Excavation and Trenching Standard, Title 29 of the Code of Federal Regulation (CFR), Part 1926.650. In Kansas, this Standard applies to both private sector and government employees because the State has adopted OSHA standards by reference in its worker safety regulations, said Terri Sanchez, director of the Kansas Department of Labor Division of Industrial Safety and Health. KDOL has inspectors who will issue citations for trenching practices that are not OSHA-compliant, and fines will be levied if the local government does not correct the problems. Safety problems are usually identified through complaints registered with KDOL, but sometimes inspectors will drive by a site and notice issues to be addressed.

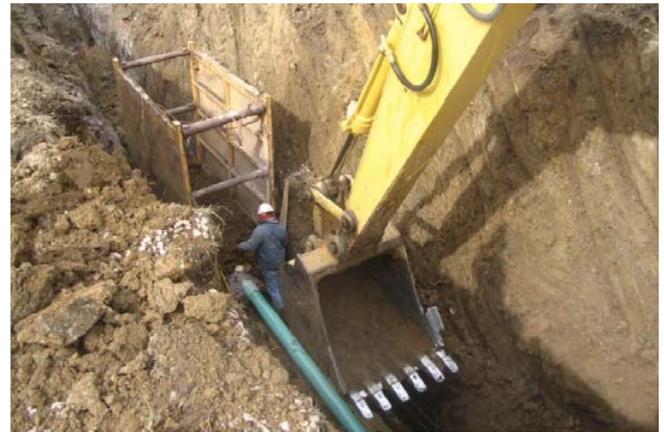
This article highlights key elements of the OSHA Standard, shows ways to protect against cave-ins, and describes work practices for safety. As you will see, safe trenching is a complex topic, involving engineering, training, proper use of the trench, and proper operations around the trench.

### **Cave-ins are biggest safety risk with trenches**

A trench is a specific type of excavation that is defined as a narrow underground excavation that is deeper than it is wide, and no wider than 15 feet at the bottom. According to OSHA's Standard, cave-ins are the greatest risk to workers for fatalities in trenching operations. They usually happen in trenches five to 15 feet deep with no warning, even in seemingly safe conditions. Earlier this year, tragically, one of the City of Manhattan's city employees died in a trench failure. It can happen to any worker, and every precaution must be taken to try to ensure worker safety.

### **What causes a cave-in?**

According to OSHA's Standard, a cave-in can be



*What is wrong with this picture? Plenty! This unsafe trench has at least six safety problems. Can you spot them? See answers at the end of this article.*



caused by a number of factors including:

- Vibrations of the operating equipment in and around the trench (e.g. dump trucks, backhoes, bobcats, jack hammers, etc.)
- Unstable adjacent structures.
- Surface water from rain and ground water, including location of the water table.
- Weather conditions such as freezing and thawing that can affect soil stability.
- Weight of soil itself. A small amount of soil can be surprisingly heavy. One cubic yard of soil can weigh as much as a car!
- Soil properties such as frictional/cohesive capacities. Soil classifications for trenching purposes must be conducted by a designated "Competent Person" (see sidebar on page 2) because many factors (such as previously disturbed soil, soil subjected to vibration, soil being submerged in water, soil from which water is freely seeping) can change physical properties of the soil.

### **How to help prevent cave-ins**

Trenches susceptible to cave-in must be protected by



## WHAT IS AN OSHA-DEFINED “COMPETENT PERSON?”

OSHA defines “Competent Person” as one who has specific training in and knowledge about soils analysis, the use of protective systems in trenching, and the requirements of OSHA’s excavation standard 29 CFR 1926.650-652, Subpart P). A trained Competent Person is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to employees, and who is authorized to take prompt corrective measures to eliminate or control these hazards and conditions.

See more at this link: <http://www.competentpersontraining.net/competentpersontrainingwichtaks.html>

one of the following three methods:

- **Slope or bench the sides of the excavation.** Slope the sides to an angle not steeper than 1-1/2:1 (H:V); for example, for every foot of depth, the trench must be excavated back 1-1/2 feet. A slope of this gradation or less is safe for any type of soil.
- **Support the sides of the excavation.** Use tabulated data such as tables and charts approved by a registered professional engineer to design the excavation. These data must be in writing and include explanatory information including the criteria for making a selection and the limits on the use of the data. At least one copy of the data, including the identity of the registered professional engineer who approved it, must be kept at the worksite during construction of the protective system. After the system is completed, the data may be stored away from the jobsite, but a copy must be provided upon request to the Assistant Secretary of Labor for OSHA.
- **Place a shield between the side of the excavation and the work area.** Use a trench box or shield designed or approved by a registered professional engineer or based on tabulated data prepared or approved by a registered professional engineer. Timber, aluminum, or other suitable materials may also be used. OSHA standards permit the use of a trench shield (also known as a welder’s hut) if it provides the same level of protection or more than the appropriate shoring system.

### Other precautions

If you are digging next to an unstable structure, make sure you provide some type of support systems such as shoring, bracing, or underpinning to ensure that adjacent structures such as buildings, walls, sidewalks, or pavements remain stable.

Do not excavate below the base or footing of any foundation or retaining wall unless

- You provide a support system such as underpinning,
- The excavation is in stable rock, or
- A registered professional engineer determines that the structure is far enough away from the excavation and that excavation will not pose a hazard to workers.

Also, do not excavate under sidewalks and pavements unless you provide an appropriately designed support system or another effective means of support.

Precaution should also be taken when working in accumulated water. Controlling water and water removal must be monitored by the designated Competent Person who determines how much water accumulation is too much. Ditches, dikes or similar means should be used to keep surface water from entering the trench.

### OSHA requirements

- Trenches need to be inspected periodically (i.e., daily, at the start of each shift, and as conditions change) by the Competent Person prior to worker entry.
- It is important to establish and maintain a safety training program for the worksite to protect employees from, and allow them to recognize job-related safety and health hazards. The Kansas Department of Labor (KDOL) has a library of workplace safety videos available for checkout, a number of which deal with trench and excavation safety. To check out a video, contact KDOL at (785) 296-4386, then 0 and extension 2307 or e-mail [jeana.payne@dol.ks.gov](mailto:jeana.payne@dol.ks.gov). To learn more about upcoming training opportunities through KDOL, call (785) 296-4386.
- Trenches 5 ft. or deeper require a protective system unless the excavation is made entirely in stable rock. If trenches are 20 ft. or deeper, the protective system shall be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer. For trenches less than 5 ft. deep, the requirement for a protective system is a judgment call for the “competent person”.
- Trenches 4 ft. or deeper require safe access including ladders, steps, ramps, or other safe means of exit for workers. These access points must be located within 25 ft. of all workers.

### General tips for trenching safety

The following tips are from a number of OSHA’s publications including posters, safety-tip cards, and fact sheets:

- Keep heavy equipment and surcharge loads at least 2 feet from trench edges. It is a good idea to provide some kind of warning system such as mobile equipment, hand or mechanical signal, or stop bars to alert the equipment operator to the edge of the trench.
- Know where underground utilities are located by staking them. If your excavation exposes them, make



sure you protect them, properly support them, or remove them as necessary.

- Test for low oxygen, hazardous fumes and toxic gases. If there are any hazardous conditions, you must provide the workers with proper respiratory protection or ventilation and regularly test them to make sure they are functioning properly.

- Inspect trenches at the start of each shift and following a rainstorm. This must be done by the designated Competent Person.

- Do not work under raised loads.
- Do not enter an unprotected trench.
- Do not work over unprotected workers.
- Wear proper personal protective gear and equipment such as hard hats, retroreflective safety vests, steel toed boots, etc.

- Only properly-trained personnel should be allowed to operate equipment.

- Provide walkways or bridges over trenches.

### In case of a trench failure

Trenching is unpredictable and dangerous. Sometimes even the best precautions will not prevent an incident. In case of an incident caused by trench failure, your action can save lives!! OSHA provides these tips:

#### DO:

- Immediately call 911, or your local Emergency Response Team.

- Report the exact location, number of injured workers, nature of the emergency, trench measurements and any special hazards.

- Keep all life-support equipment such as breathing apparatus, safety harnesses and lines readily available, and keep dewatering systems operating in case of water

accumulation in the trench.

- Clear workers away from the excavation.
- Shut down heavy equipment.
- Be prepared to meet and brief rescue personnel.

#### DON'T:

- Don't panic!
- Don't sacrifice anyone else. Control would-be rescuers.

- Never attempt to dig someone out using motorized equipment.

#### In sum

There are very specific safety requirements for trench digging in the OSHA Standard for Trenching and Excavating that apply to private sector workers and to public employees in Kansas. Make sure those requirements are followed for your projects.

For more information and technical assistance, contact Kyle Lang, public safety coordinator, at the Kansas Department of Labor: phone (785) 296-4386, ext. 2319. In addition to the safety training videos mentioned earlier, KDOL will provide free, on-site consultation/training for your employees for trench-digging. Sanchez said the DOL wants to work with local governments and their contractors, and KDOL will not assess fines if the problems are remedied.

You can also contact OSHA with questions. Kansas is in OSHA's Region VII and they have an Area Office in Wichita (<https://www.osha.gov/osmdir/ks.html>.) ■

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**Trench-safety problems in photo on page 1:** 1) improper sloping; 2) spoil pile too close to the edge; 3) worker is outside the trench box; 4) trench box is not an effective design; 5) worker too closer to the excavator; 6) no ladder.



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