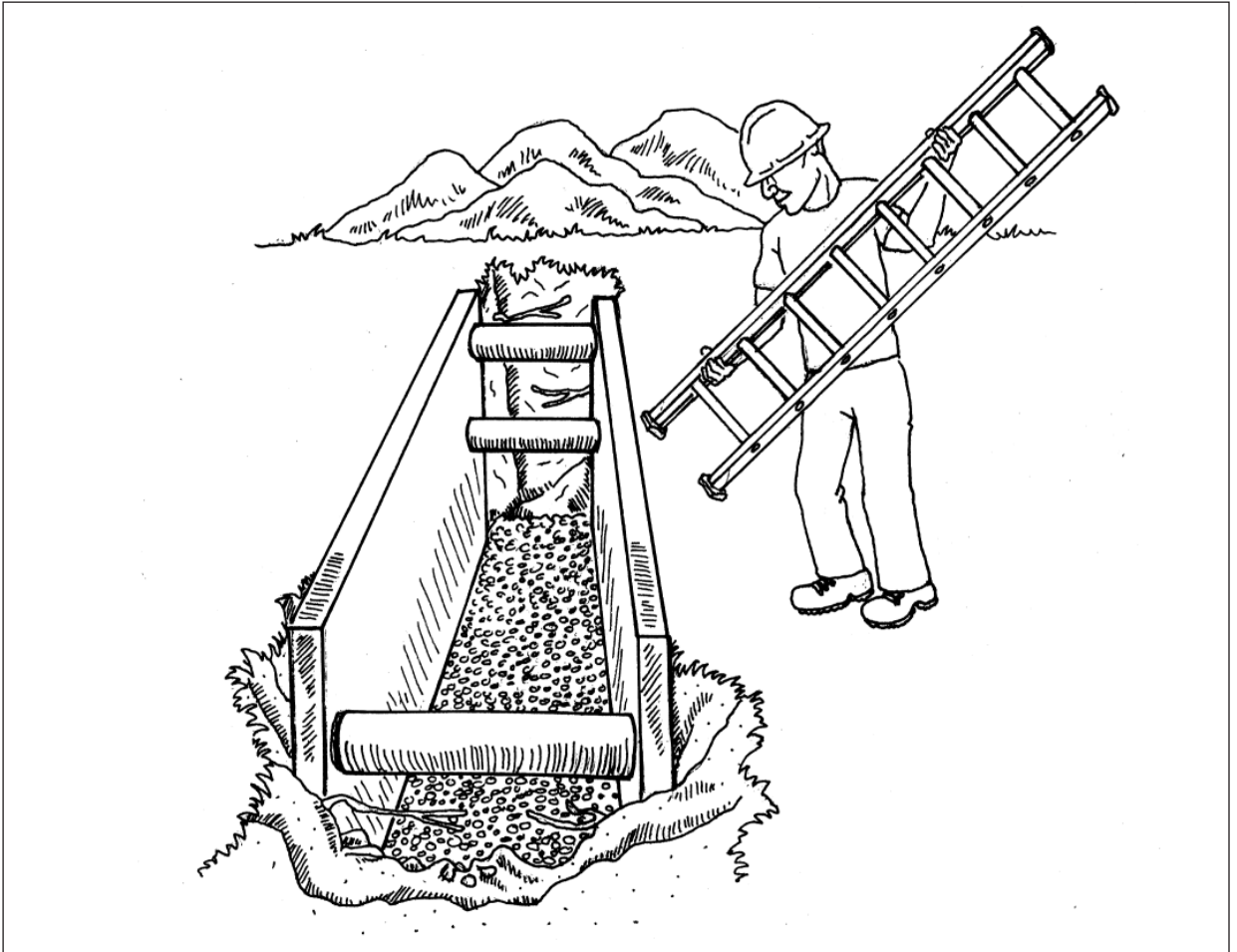


## FOCUS 4

# CONSTRUCTION SAFETY & HEALTH



## ‘Caught In-Between’ Hazards *Participant Guide*

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## “Caught in-Between” Hazards

“*Caught in-between*” hazards kill workers in a variety of ways. These include: cave-ins and other hazards of excavation work; body parts pulled into unguarded machinery; standing within the swing radius of cranes and other construction equipment; caught between equipment & fixed objects.

### EXCAVATION AND TRENCHING HAZARDS

Excavation hazards are common on construction sites. These workers are **more than twice as likely to be killed** as workers in any other type of construction work. Excavations and trenches are unstable by nature, and many types of serious hazards exist when doing this type of work.

### WHAT CAN GO WRONG ON AN EXCAVATION?

- *Cave-ins* can **SUFFOCATE OR CRUSH** workers.
- *Hazardous atmospheres* can **KILL OR INJURE** workers:
  - *Oxygen deficiency* can **SUFFOCATE** a worker.
  - *Flammable gases or vapors* can cause **FIRES and EXPLOSIONS**.
  - *Toxic gases or vapors* can **kill or seriously injure workers**.
- *Workers can DROWN* in water, sewage or chemicals if these haven’t been controlled – by diverting them elsewhere or *locking them out* – to prevent worker exposure.
- *Workers can face BURNS, ELECTROCUTION OR EXPLOSIONS* while working around various underground utilities, such as steam, hot water, gas, electricity.

CAVE-INS can happen:

1. when the *soil is unstable*;
2. when there is a lot of *vibration from trains, trucks, traffic or machinery*;
3. when there is *too much weight, too close to sides of the excavation*, from excavated material (“spoils”), tools, equipment, materials or vehicles at the site;
4. when there is *water* in the excavation; or
5. when there are *changes in the weather*, like heavy rain, freezing, melting, etc.

**Don’t get caught!** Take the proper precautions to ensure that you are working safely. Wear all required personal protective equipment. A mistake in excavation/trenching procedures may not give you a second chance!

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*Excavations and trenches are unstable by nature, and many types of serious hazards exist when doing this type of work.*

## EXERCISE

### What's Wrong With This Excavation?

Read the story and answer the questions: you should use the fact sheet that follows the story to help you answer the questions.

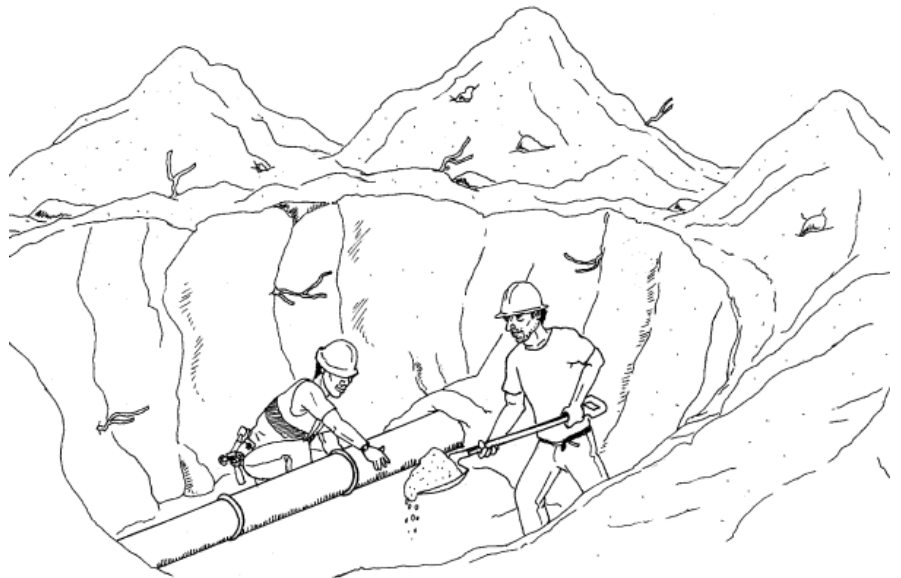
Union rep Bob Smith called the manager of ABC Company to insist that an unprotected excavating job be shut down immediately. He had received a call from his union safety steward, Jim Riley, about the problems at the site. The day before, Jim complained to his supervisor that a **deep trench** (about eight (8) feet deep), which was about four (4) feet wide at its base, was **not shored** (the sides of the trench weren't supported to prevent a cave-in). The supervisor told Jim to shore it himself, which he tried to do.

When Jim came to work the second day, he saw some of his co-workers working in a second trench, which was also not shored. Excavated material was piled high, right at the edges of both trenches. Both trenches were about eight (8) feet deep. Workers were trying to repair a broken steam line. The steam line had been previously *locked out* and drained at the power plant supplying the steam.

Within one hour, Bob and an OSHA inspector arrived at the site after the union got management to shut down the job. The union acted because workers were exposed to "imminent danger to life or serious harm" and "the management of ABC Company had refused to cooperate with the union steward's efforts to do the job safely."

When the inspection took place, the OSHA inspector found:

- ✓ the **soil content** was **87 percent sand**;
- ✓ the **depth** of the two excavations was **eight (8) feet, plus the height of the excavated material** piled right on the edge;
- ✓ there was **no shoring or other protective system** on one of the excavations;
- ✓ there was **inadequate sloping and shoring** in the other excavation;
- ✓ the **workers were not trained**, and didn't know how to properly construct shoring or other protective systems.



**Unsafe Work:** Workers are in a trench more than five (5) feet deep, with no protective system in place.

## QUESTIONS

1. What happened at this excavation site?
2. What were some of the violations of trenching safety?
3. What kind of soil type was present at this excavation, and what should this have told the responsible people at the site?
4. What was wrong with the way material was removed from this excavation?
5. What training should have been done to protect these workers?

## SUMMARY

### Protect Yourself On Excavation Sites

1. OSHA requires a *competent person* to be on-site when doing excavations. That person must be able to recognize hazards that exist and hazards that could occur, and that person **must have the authority to take action** to correct those conditions. S/he must also inspect the excavation, the surrounding areas, and the protective systems every day before the start of work.
2. For all excavations and trenches **deeper than 5 feet, but less than 20 feet deep**, you must use one of three methods:
  - a. **Sloping or benching.** *Sloping* involves cutting back the sides of the trench to a safe angle so it won't collapse. *Benching* is a variation that adds a series of benches (steps) that also approximate the safe sloping angle. **The angle that you use for sloping depends on the soil type. Soil types are: Solid rock, Type A, Type B and Type C (which is the least stable).** However, using a cutback slope of 1-1/2 feet horizontal to 1 foot vertical is a safe sloping angle for all soil types. Note: *Type C soil can only be sloped: it's too unstable to be benched.*



**Sloping:** The safe angle for the slope depends on the soil type.

A slope of 1.5 feet Horizontal to 1 Foot Vertical (Type C slope) is safe for all soil types.

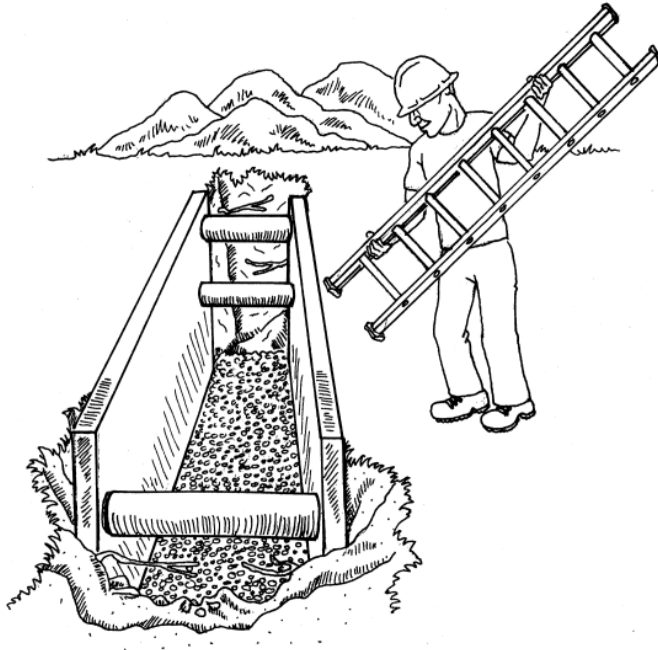


**Benching:** This is a safe method with Type A or Type B soil only.

NOTE: Graphic is for illustrative purposes only. Actual dimensions of vertical walls and horizontal benches will be larger, and these dimensions will vary by soil type: Type A or Type B (see OSHA standards).

OR

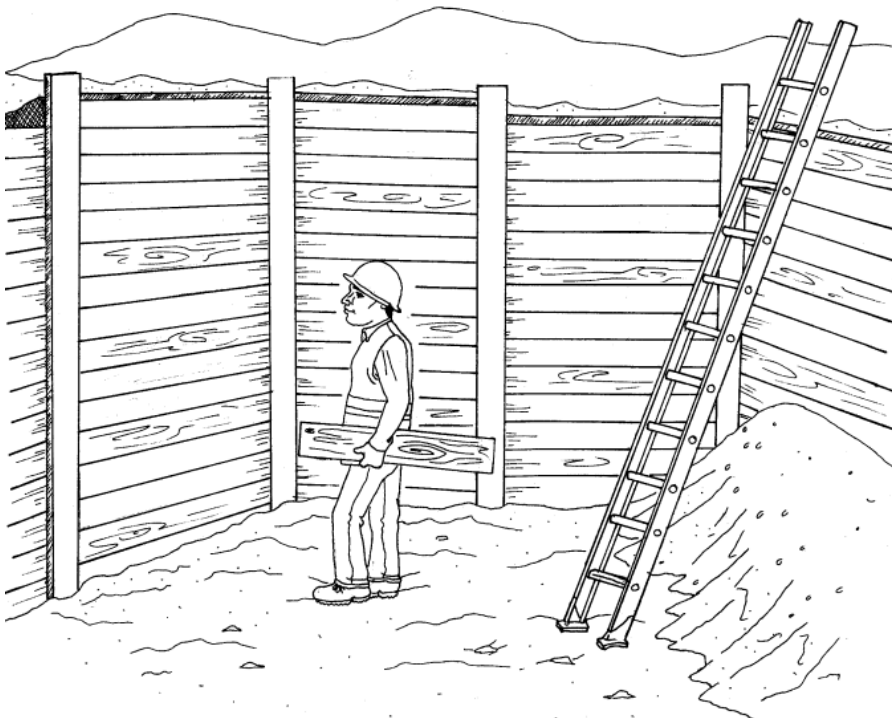
- b. **Trench box or shield:** Although these are NOT designed to prevent cave-ins, they should protect workers within the structure if a cave-in occurs.



**Trench Box:** This worker will be safe as long as he stays inside the trench box while performing his work.

OR

- c. **Shoring:** These are structures built of timber, or they can be mechanical or hydraulic systems, that support the sides of an excavation. **Sheeting** is a type of shoring that keeps the earth in place.



**Shoring:** The worker in the excavation is protected by a shoring system.

(But watch out for that ladder! It doesn't extend at least three (3) feet above the top of that wall for safe access and egress.)



3. With **shoring and shielding**, workers are **only protected** as long as they stay **within the confines** of the system.
4. If *the competent person sees signs of a possible cave-in*, **even at depths less than 5 feet**, one of the protective systems must be used.
5. If *the excavation is more than 20 feet deep*, a professional engineer must design the system to protect the workers.
6. A **ladder, stairway or properly designed ramp is required** in any trench **4 feet or deeper at least every 25 lineal feet of the trench**. It's best to have one at each end of an excavation.
7. A **competent person must determine the type of soil** (Solid Rock, Type A, Type B, Type C) by using at least one visual and one manual test. **This must be done before anyone enters the excavation.**
8. **Hazardous atmospheres** can sometimes be a danger in excavations. *Air Testing* is done in the following order, and hazards can include:
  - **Oxygen-deficient atmospheres** can asphyxiate (suffocate) you. You need at least 19.5 percent oxygen. Normal level is 20.9 percent.
  - **Flammable gases or vapors**, that reach a certain concentration known as their *Lower Explosive Limit (LEL)*, can lead to fires and explosions. In *Excavations*, you can't exceed 20 percent of the LEL. (In *Confined Spaces* – a different standard – it's 10 percent of LEL.)
  - **Toxic gases or vapors** can poison you, leading to death or serious health problems. Don't exceed *Permissible Exposure Limits (PELs)*.
9. Remember: **CALL BEFORE YOU DIG**. Call 811 to contact your local one-call service **several days before you dig**, to locate and mark with proper color codes all underground utilities. These could be: electrical, gas, water, sewer, steam, chemical and telecommunications. You must take additional precautions when reaching marked locations.
10. **BEWARE – SOIL IS VERY HEAVY!** Some types of soil can weigh around 3,000 pounds (that's 1.5 tons!) for every cubic yard. **Don't take chances** – make sure a competent person has put a protective system in place before you start work.

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*Remember, the fatality rate of construction workers killed in unsafe excavations is **MORE THAN TWICE** the rate for all other construction workers that are killed on the job.*



## SUMMARY

# Protect Yourself From “Being Caught-In...”

### IT COULD SAVE YOUR LIFE AND LIMBS!

In addition to cave-ins, there are other ways that workers can get “caught in” or “caught between” that can lead to death or serious injury.

**1. HAZARD: Unguarded machinery.** Workers can get parts of their body, or their clothes, caught in machines.

#### PROTECT YOURSELF!

Machines must always be *properly guarded*. Workers should follow *lock-out/tag-out* procedures to prevent being injured when a machine is being repaired. Employers must train workers how to recognize and avoid these unsafe conditions.

**2. HAZARD: Being caught between a vehicle and an object.** Workers can be hit by a swinging structure, like a crane, or be caught between other moving vehicles, like forklifts, and solid objects.

#### PROTECT YOURSELF!

Workers need to be trained on the dangers of passing between swinging structures of equipment (like a crane) and other solid objects. Barricades should be used to keep workers out of the area within the *swing radius* of the equipment. Employers must train workers how to recognize and avoid these unsafe conditions.

**3. HAZARD: Being caught between objects.**

#### PROTECT YOURSELF!

Employers must train workers how to recognize these hazards. Wear a seatbelt, if required, to avoid being thrown from a vehicle. Loads carried by powered industrial trucks must be stable and secure.

**4. HAZARD: Being caught in a piece of equipment or machinery.**

#### PROTECT YOURSELF!

Employees must be instructed how to recognize and avoid unsafe conditions like these. Follow proper *lockout/tagout* procedures whenever you repair or maintain equipment and machinery. *Turn off* any and all vehicles whenever you do any repair or maintenance work. *Block wheels* of vehicles to stop movement, and make sure you are properly trained to work safely on this equipment. *Lower or block the blades* of bulldozers, scrapers and similar equipment when making repairs or when they are not in use.

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***Don't become a statistic!*** Learn to identify these dangerous situations, and ensure that your employer has a program in place to prevent you from being injured or killed.