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OSHA Training Institute

# Construction Focus Four: Caught-In or -Between Hazards

INSTRUCTOR GUIDE



# Construction Focus Four: Caught-In or -Between Hazards

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# Construction Focus Four: Caught-In or -Between Hazards

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# Construction Focus Four: Caught-In or -Between Hazards

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## TRAINER PREPARATION GUIDANCE

The “Construction Focus Four: Caught-In or -Between Hazards” lesson is part of the 4-hour block consisting of segments on each of the Focus Four Hazards: Falls, Caught-In or -Between, Struck-By and Electrocution. Because most construction fatalities are caused by fall hazards, falls must be covered for at least one hour, and we recommend at least one hour and 15 minutes. The other focus four hazards lessons, such as this one, must be covered for a minimum of one-half hour each. This training is developed to be used in both the 10- and 30-hour OSHA Outreach Training programs and if applicable, for other safety and health training purposes.

**Using the Instructor Guide (IG):** The IG consists of instructions for trainer preparation, resources, a lesson plan, references, and Appendices. The IG contains content, activities and notes for the instructor. **It is not intended to be a script that is read verbatim to the students. Rather, instructors should review the entire guide (including referenced materials and internet links) prior to conducting training, and use it as a resource in their planning and presentation.**

**The learning objectives and testing:** The “Construction Focus Four: Caught-In or -Between Hazards” lesson segment was developed based on the terminal (TO) and enabling objectives (EO) below. These objectives are the expected student outcomes; therefore, 1) the instructor may not vary from these objectives when planning the training session; and 2) the objectives must be measured by testing the student’s achievement. A test is provided in Appendix A; however, the trainer may develop a modified set of test questions to meet the needs of the audience as well as to measure the student’s achievement of the stated objectives.

**TO:** Given current OSHA and industry information regarding construction worksite illnesses, injuries and/or fatalities, the student will be able to recognize Caught-in or -between hazards in construction.

*Specifically, the student will be able to:*

**EO 1:** Identify common caught-in or -between hazards

**EO 2:** Describe types of caught-in or -between hazards

**EO 3:** Protect themselves from caught-in or -between hazards

**EO 4:** Recognize employer requirements to protect workers from caught-in or -between hazards

**Using the Slid Presentation:** The Microsoft PowerPoint® 2003 presentation file consists of caught-in or -between hazard recognition photos which the trainer may use as an activity during the session. The presentation format is one slide asking if students recognize any hazards followed by a slide displaying the same photo containing the answer. The instructor may add additional slides to the presentation based on the lesson content or use their own slides, if appropriate to the lesson content.

**Appendices:** Provided in the Appendices are the instructor and student copies of the lesson test, lesson activity documents along with student handouts. Refer to the Table of Contents for details.

**Media and/or Teaching Methods:** This lesson is one of four segments covering the construction focus four hazards. It has been set up as a facilitated, interactive training session. Students are given small “chunks” of information, and then are able to practice their understanding of the subject matter via activities and workshops. There is a lesson test provided for each focus four segment.

**Ideal Setting or Conditions for the Training Session:** The ideal setting is a classroom or other area where students have space to break into groups.

**Disclaimer:** This Compliance Assistance product is **not** a standard or regulation, and it creates no new legal obligations. The Compliance Assistance product is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. Pursuant to the Occupational Safety and Health Act, employers must comply with safety and health standards promulgated by OSHA or by a State with an OSHA-approved State Plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or to abate the hazard. However, failure to implement these recommendations is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

# Construction Focus Four: Caught-In or -Between Hazards

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## Online Resources

### OSHA eTools

- OSHA Construction eTool: <http://www.osha.gov/SLTC/etools/construction/index.html>
- OSHA Lockout/Tagout eTool: <http://www.osha.gov/dts/osta/lototraining/index.html>
- OSHA Machine Guarding eTool: <http://www.osha.gov/SLTC/etools/machineguarding/index.html>

### OSHA Publications

- OSHA 3120 Control of Hazardous Energy (Lockout/Tagout): <http://www.osha.gov/Publications/osha3120.pdf>
- OSHA 2226 Excavations: <http://www.osha.gov/Publications/osha2226.pdf>
- OSHA 3080 Hand and Power Tools: <http://www.osha.gov/Publications/osha3080.pdf>
- OSHA 3150 A Guide to Scaffold Use in the Construction Industry: <http://www.osha.gov/Publications/osha3080.pdf>

### OSHA Quick Cards

- Demolition Safety Tips (also available in Spanish): [http://www.osha.gov/OshDoc/data\\_Hurricane\\_Facts/demolition\\_safety\\_tips.pdf](http://www.osha.gov/OshDoc/data_Hurricane_Facts/demolition_safety_tips.pdf)
- Top Four Construction Hazards (also available in Spanish): [http://www.osha.gov/OshDoc/data\\_Hurricane\\_Facts/construction\\_hazards\\_gc.pdf](http://www.osha.gov/OshDoc/data_Hurricane_Facts/construction_hazards_gc.pdf)
- Working Safely in Trenches (also available in Spanish): [http://www.osha.gov/Publications/trench/trench\\_safety\\_tips\\_card.pdf](http://www.osha.gov/Publications/trench/trench_safety_tips_card.pdf)

### OSHA Safety & Health Topic Page

- Control of Hazardous Energy (Lockout/Tagout): <http://www.osha.gov/SLTC/controlhazardousenergy/index.html>
- Hand and Power Tools: <http://www.osha.gov/SLTC/handpowertools/index.html>
- Machine Guarding: <http://www.osha.gov/SLTC/machineguarding/index.html>
- Residential Construction Industry: <http://www.osha.gov/SLTC/residential/index.html>
- Trenching and Excavation: <http://www.osha.gov/SLTC/trenchingexcavation/index.html>

### NIOSH Safety & Health Topic Page

- Machine Safety: <http://www.cdd.gov/niosh/topics/machine/>
- Trenching and Excavation: <http://www.cdc.gov/niosh/topics/trenching/>

### NIOSH Fatality Assessment and Control Evaluation (FACE) Program:

<http://www.cdc.gov/niosh/face/>

**Electronic Library of Construction Occupational Safety & Health materials, developed by CPWR – Center for Construction Research and Training, with funding from NIOSH <http://www.elcosh.org/>**  
NOTE: Materials may be copyrighted.




# Construction Focus Four: Caught-In or -Between Hazards



## Overview

The purpose of this lesson is to provide workers with information that will enable them to recognize common caught-in or -between hazards at construction worksites. This Instructor Guide is intended to be used when presenting the OSHA Training Institute Construction Outreach 10- and 30-hour course. The lesson is comprised of the following four topics:

1. What is a caught-in or -between hazard?
2. What are the common types of caught-in or -between hazards in construction?
3. How can I protect myself from caught-in or -between hazards?
4. What is my employer required to do to protect workers from caught-in or -between hazards?

 <b>Materials Needed</b>	 <b>Training Preparation</b>	 <b>Student Handouts</b>
<ul style="list-style-type: none"><li>▪ Flip chart and markers</li><li>▪ Presentation slides</li><li>▪ Student handouts</li><li>▪ Student copies of planned activities</li><li>▪ Copy of the OSHA Construction Standards</li><li>▪ Copies of Fatal Facts Accident Summary(s) worksheets for students</li><li>▪ Copies of test for students</li><li>▪ Small prizes for class activities</li><li>▪ If activity files are used for hazard recognition, copy PPTinstrHazRecAlt_CaughtlorB_April2011.pdf and PPTstudentHazRecAlt_CaughtlorB_April2011.pdf</li></ul>	<ul style="list-style-type: none"><li>▪ Review Online Resources listed in this document</li><li>▪ Review OSHA Construction standards</li><li>▪ Review instructor materials on Review Exercise, Test, and Fatal Facts Accident Summary(s) in Appendices A, B, C</li><li>▪ Make copies of Review Exercise and Test for students found in Appendix A and B</li><li>▪ Make copies of Fatal Facts worksheets for students found in Appendix C</li></ul>	<ul style="list-style-type: none"><li>• The 10 Fatal Facts Accident Summary worksheets the students will complete during this session become their handouts to refer to for hazard recognition and prevention</li></ul>



# Construction Focus Four: Caught-In or -Between Hazards

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## Instruction for this session:

1. Ask the class for an example of a hazard on a construction site that could cause a worker to be caught-in or -between objects. Discuss the examples with the class. Be sure that examples of the most common caught-in or -between hazards (caught in machinery; buried in or by; crushed by; pinned between) are covered.
2. Discuss “Content” section.
3. Show photos of caught-in or -between hazards and have the class identify the caught-in or – between hazards in each. Obtain photos of activities that are relevant to the audience or use some of the photos from the Hazard Recognition slides.
4. If time permits, conduct one of the following small group activities:
  - Accident Prevention Workshop (Determination of Accident Prevention Recommendations) – Select Fatal Facts to use (see presentation file and Appendix C). Divide the class into 3 groups and have each group analyze one of the scenarios and provide recommendations for the prevention.
  - Hazard Recognition Competition - Divide the class into two teams. Display hazard recognition photos. The first team to correctly identify a hazard in the photo gets a point – highest score wins. Award a small prize (candy bar, pen, or some other small object) to the members of the winning team
5. Conduct the lesson test and discuss answers with the students

## NOTES:

Refer to hazard recognition presentation file titled: CaughtlorB\_HazRec\_03.2011.ppt

As an alternative, trainers can use their own photos in the hazard recognition presentation. If the presentation is used as provided, the trainer can use the activity files provided to add interactivity by having the students involved in note taking. To conduct the activity, locate and print the PDF files titled: PPTinstrHazRecAlt\_CaughtlorB\_April2011.pdf and PPTstudentHazRecAlt\_CaughtlorB\_April2011.pdf

For group activity Accident Prevention Workshop option, use Fatal Fact Accident Summary scenarios – see file: AccidentPrevWorkshop.ppt Numbers 15, 31, and 73 are suggested; see file and refer to Appendix C for answers and student worksheets.

A complete set of Fatal Facts can be found at: [http://www.osha.gov/OshDoc/toc\\_FatalFacts.html](http://www.osha.gov/OshDoc/toc_FatalFacts.html)

Locate instructor and student copies of test in Appendix A.

# Construction Focus Four: Caught-In or -Between Hazards

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## Topic 1: What is a caught-in or -between hazard?

- A. Definition
- B. Examples
- C. Statistics

### Content for Topic 1:

#### A. Definition

The key factor in making a determination between a *Caught* event and a *Struck* event is whether the impact of the object alone caused the injury. When the impact alone creates the injury, the event should be recorded as *Struck*. When the injury is created more as a result of crushing injuries between objects, the event should be recorded as *Caught*.

Events that should be classified as *Caught* include:

- Cave-ins (trenching)
- Being pulled into or caught in machinery and equipment (this includes strangulation as the result of clothing caught in running machinery and equipment)
- Being compressed or crushed between rolling, sliding, or shifting objects such as semi-trailers and a dock wall, or between a truck frame and a hydraulic bed that is lowering

#### NOTES:

Transportation accidents in which at least one vehicle was in normal operation are not included in this discussion of caught-in or – between hazards.

According to OSHA, caught-in or -between hazards are defined as: Injuries resulting from a person being squeezed, caught, crushed, pinched, or compressed between two or more objects, or between parts of an object. This includes individuals who get caught or crushed in operating equipment, between other mashing objects, between a moving and stationary object, or between two or more moving objects.

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## B. Examples

Caught-in or -between hazards in construction cause accidents such as the following:

- A worker was ripping a 6-inch piece of wood on an unguarded compound miter saw. His left thumb was caught in the saw and amputated.
- An employee was performing diagnostic work on a water truck at a construction site. The worker crawled under the operating truck. The employee's work shirt collar and coveralls became caught on a projecting set screw on the rotating pump shaft. The set screw pulled him into the pump shaft. The employee died en route to the hospital.
- A worker climbed onto an I-beam to clean muck off the tail pulley of a conveyor belt attached to a separator. While the conveyor system was energized and in operation, the employee reached between the feed and return of the belt in front of the tail pulley with his hand to brush the muck off the belt. He was caught by the moving belt, and his hand and arm were pulled into a pinch point in the tail pulley. The employee's arm was fractured.
- A worker was in the bottom of a 9.5-foot deep trench, setting grade for concrete pipe while the employer was installing additional shoring. During the shoring installation, the west wall at the south end of the excavation caved-in and covered the worker. There was no shoring or protective system at the location of the trench. The employee was dug out by coworkers and the fire department and survived.
- An employee and a co-worker were working in a 9-foot deep excavation installing water pipes, when the south side of the excavation caved in on the employee and buried him. The employee was killed.

## NOTES:

Select examples to discuss with the class, or provide examples of accidents related to the type of work your audience does. You can locate accident summaries on OSHA's website.

Go to:

<http://www.osha.gov/pls/imis/accidentsearch.html>

Within the keyword field, enter a keyword to be searched against. For example, to obtain accident investigations involving trenching or excavation cave-ins, enter the key word Cave-In. To view a list of key words, use the keyword list at the bottom of the Accident Investigation Search page.

Another source of accident descriptions is the NIOSH Fatality Assessment and Control Evaluation (FACE) Program.

Go to:

<http://www.cdc.gov/niosh/face/>

## Construction Focus Four: Caught-In or -Between Hazards

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- Two laborers were framing out footing for foundation walls in an excavation 100-foot long by 45-foot wide by 10-foot deep. The adjacent property along the north wall of the excavation consisted of seven garages, with a 10-foot high cinderblock wall. The cinderblock wall was undermined approximately 2 feet and was not supported. The wall collapsed, crushing the laborers. One was killed and the other was taken to the hospital for back and shoulder injuries.
- A worker was operating a road grader when the engine died and the vehicle began to roll toward a small ravine. The employee jumped off the grader but was pulled under the grader as it overturned. He was killed when he was crushed underneath the tires.
- An employee was working from an aerial lift, which was in the “up” position, under an I-beam. He accidentally came into contact with the “drive/steer” lever, which made the manlift move. The employee was killed when he was pinned between the I-beam and manlift control panel.
- A worker was cleaning an asphalt paving spreader. Another worker was repairing a pavement roller. The roller was accidently put into motion and it rolled toward the spreader. The first employee was injured when he was pinned between the two machines.
- An employee was placing dunnage underneath the sheet metal. A coworker was operating a powered industrial forklift loading sheet metal onto a flatbed truck. As the coworker was loading the sheet metal onto the flatbed truck, one of the bands holding the sheet metal together either broke or the clamp was not properly secured. The back band failed and the load of sheet metal slid forward onto the employee, pinning him under the sheet metal and against a dumpster. The employee was hospitalized and treated for a fractured leg and a dislocated knee.

### NOTES:

# Construction Focus Four: Caught-In or -Between Hazards

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## C. Statistics

In 2008, the Bureau of Labor Statistics (BLS) reported that the total number of fatal work injuries involving caught-in or –between hazards remained about the same for all of private industry as in 2007. However, the number of such fatalities has increased by approximately 10% since 2003. In 2008, the private construction industry alone accounted for 92 of the caught-in or –between fatalities, or approximately 23% of the total.

The number of fatalities involving caught-in or –between hazards in the private construction industry has decreased by about 20% since 2003. The biggest decrease in caught-in or –between fatalities in the private construction industry has been in excavation or trenching cave-ins. There were 44 such fatalities in 2003 and only 16 in 2008.

Altogether, 975 private-industry construction workers died on the job in 2008, with 92 of them (9%) killed as a result of caught-in or –between hazards.

Occupational fatalities caused by caught in- or –between hazards are serious concerns. This lesson will help you identify these hazards at your worksite so that you can be protected.

## Review Exercise

Distribute Review Exercise worksheet to students. Provide time to complete the worksheet and discuss the correct answers.

## NOTES:

For the most current statistical data, or for more detail, see: <http://www.bls.gov/iif/>

Locate the Review Exercise in Appendix B.

# Construction Focus Four: Caught-In or -Between Hazards

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## Topic 2. What are the common types of caught-in or -between hazards in construction?

- A. Machinery that has unguarded moving parts causing caught-in or -between incidents
- B. Buried in or by
- C. Pinned between

### Content for Topic 2

Some of the working conditions that contribute to caught in- or –between hazards include: Machinery that has unguarded moving parts or that is not locked-out during maintenance; unprotected excavations and trenches; heavy equipment that tips over, collapsing walls during demolition; and working between moving materials and immovable structures, vehicles, or equipment.

#### A. Machinery that has unguarded moving parts Major Hazards:

Almost all sites use machinery that has moving or rotating parts or that requires maintenance or repair at some point during construction. If machinery is not properly guarded or de-energized during maintenance or repair, injuries from caught-in or –between hazards may result, ranging from amputations and fractures to death. When machines or power tools are not properly guarded, workers can get their clothing or parts of their body caught in the machines. If machines are not de-energized (locked-out) when they are being repaired, they may cycle or otherwise start up and catch a worker’s body part or clothing and cause injury or death.

Workers can be trapped and crushed under heavy equipment that tips, especially if they are thrown from the equipment.

### NOTES:

For additional information on Caught-In Machinery hazards, refer to list of online resources to find:

[OSHA Safety & Health Topic Page for Control of Hazardous Energy \(Lockout/Tagout\)](#)

[OSHA Safety & Health Topic Page for Hand and Power Tools](#)

[OSHA Safety & Health Topic Page for Machine Guarding](#)

[OSHA 3120 Control of Hazardous Energy \(Lockout/Tagout\)](#)

[OSHA 3080 Hand and Power Tools](#)

[OSHA Lockout/Tagout eTool](#)

[OSHA Machine Guarding eTool](#)

[NIOSH Safety & Health Topic Page on Machine Safety](#)

# Construction Focus Four: Caught-In or -Between Hazards

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Examples of accidents related to machinery or tools that are unguarded; machine parts that are not sufficiently supported, secured or otherwise made safe; and equipment that tips over.



## Classroom Exercise Fatal Facts Accident Summary Reports

**Discuss the following accidents and how each could have been prevented.**

- A three-man crew was installing an underground telephone cable in a residential area. They had just completed a bore hole under a driveway using a horizontal boring machine. The bore hole rod had been removed from the hole. While the rod was still rotating, the operator straddled it and stooped over to pick it up. His trouser leg became entangled in the rotating rod and he was flipped over. He struck tools and materials, sustaining fatal injuries.
- A laborer was steam cleaning a scraper. The bowl apron had been left in the raised position. The hydraulically controlled apron had not been blocked to prevent it from accidentally falling. The apron did fall unexpectedly and the employee was caught between the apron and the cutting edge of the scraper bowl. The apron weighed approximately 2500 pounds.
- An employee was driving a front-end loader up a dirt ramp onto a lowboy trailer. The tractor tread began to slide off the trailer. As the tractor began to tip, the operator, who was not wearing a seat belt, jumped from the cab. As he hit the ground, the tractor's rollover protective structure fell on top of him, crushing him.

### NOTES:

Go to:

<http://www.osha.gov/pls/imis/accidentsearch.html> and search by keyword for additional examples

To display the slides associated with the Fatal Facts activity see file: AccidentPrevWorkshop.ppt

Distribute student worksheets.  
Refer to Fatal Facts Accident Summary No. 18

Distribute student worksheets.  
Refer to Fatal Facts Accident Summary No. 5

Distribute student worksheets.  
Refer to Fatal Facts Accident Summary No. 38



# Construction Focus Four: Caught-In or -Between Hazards

## B. Buried in or by

### Major Hazards:

The major hazard related to buried in or by is cave-ins of unprotected trenches and excavations. Cave-ins crush or suffocate workers. In addition, trenches may contain hazardous atmospheres; workers can drown in water, sewage, or chemicals in the trenches; and if working around underground utilities, workers may also face burns, electrocution or explosions from steam, hot water, gas, or electricity. Workers who are working underneath large scaffolds may also be buried if the scaffolds collapse. Workers may be buried and crushed by walls that collapse during demolition.

### Examples of accidents related to buried in or by hazards



### Classroom Exercise Fatal Facts Accident Summary Reports

### Discuss the following accidents and how each could have been prevented.

- An employee was installing a small diameter pipe in a trench 3 feet wide, 12-15 feet deep and 90 feet long. The trench was not shored or sloped nor was there a box or shield to protect the employee. Further, there was evidence of a previous cave-in. The employee apparently re-entered the trench, and a second cave-in occurred, burying him. He was found face down in the bottom of the trench.
- An employee was working in a trench 4 feet wide and 7 feet deep. About 30 feet away a backhoe was straddling the trench. The backhoe operator noticed a large chunk of dirt falling from the side wall behind the worker in the trench. He called out a warning. Before the worker could climb out, 6 to 8 feet of the trench wall had collapsed on him and covered his body up to his neck. He suffocated before the backhoe operator could dig him out. There were no exit ladders. No sloping or shoring had been used in the trench.

### NOTES:

For additional information on trenching and excavations, see:

- OSHA Safety & Health Topic Page for Trenching and Excavation OSHA 2226 Excavations
- NIOSH Safety & Health Topic Page on Trenching and Excavation:
- Supported Scaffold Inspection Tips OSHA Quick Card
- Demolition Safety Tips OSHA Quick Card (also available in Spanish)

Go to:

<http://www.osha.gov/pls/imis/accidentsearch.html> and search by keyword for additional examples

To display the slides associated with the Fatal Facts activity see file: AccidentPrevWorkshop.ppt

Distribute student worksheets. Refer to FatalFacts Accident Summary No. 22

Distribute student worksheets. Refer to FatalFacts Accident Summary No. 61



# Construction Focus Four: Caught-In or -Between Hazards

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## C. Pinned between Major Hazards:

You can be pinned between equipment and a solid object, such as a wall or another piece of equipment; between materials being stacked or stored and a solid object, such as a wall or another piece of equipment; or between shoring and construction materials in a trench. These types of hazards can result in multiple broken bones, asphyxiation, or death.

## Examples of accidents related to pinned between hazards:



### Classroom Exercise Fatal Facts Accident Summary Reports

## Discuss the following accidents and how each could have been prevented.

- Contractor was operating a backhoe when an employee attempted to walk between the swinging superstructure of the backhoe and a concrete wall. The employee approached the backhoe from the operator's blind side; the superstructure crushed him against the wall.
- Four workers were in an excavation approximately 9 feet wide, 32 feet long and 7 feet deep. Steel plates being used as shoring, were placed vertically against the north and south walls of the excavation at a 30-degree angle [no horizontal braces between the plates]. The steel plate on the south wall tipped over, pinning (and killing) an employee between the steel plate and the pipe casing. The backhoe was being operated adjacent to the excavation.

## NOTES:

For additional information on pinned between hazards, see: OSHA 3150 A Guide to Scaffold Use in the Construction Industry: <http://www.osha.gov/Publications/osh3080.pdf>

Go to: <http://www.osha.gov/pls/imis/accidentsearch.html> and search by keyword for additional examples

To display the slides associated with the Fatal Facts activity see file: AccidentPrevWorkshop.ppt

Distribute student worksheets. Refer to FatalFacts Accident Summary No. 50

Distribute student worksheets. Refer to FatalFacts Accident Summary No. 13

# Construction Focus Four: Caught-In or -Between Hazards

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## Topic 3. How can I protect myself from caught-in or -between hazards?

- A. Use Machinery that is Properly Guarded
- B. Use Other Methods to Ensure that Machinery Is Sufficiently Supported, Secured or Otherwise Made Safe
- C. Protect Yourself from Being Pinned Between Equipment, Materials, or Other Objects
- D. Protect Yourself on Excavation Sites
- E. Training

### CONTENT for Topic 3:

#### A. Use machinery that is properly guarded

- Never remove a safety guard when a tool is being used. Hazardous moving parts of power tools and equipment need to be safeguarded. For example, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded if such parts are exposed to contact by workers.
- Be sure to avoid wearing loose clothing or jewelry that can be caught in moving parts.

#### B. Use other methods to ensure that machinery is sufficiently supported, secured or otherwise made safe

Make sure that your equipment is de-energized and cannot be started accidentally. First, disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits, and cutters. Turn off vehicles before you do maintenance or repair work. If possible, lock out the power source to the equipment. The type of power source may be electric, pneumatic, liquid fuel, hydraulic, or powder-actuated. Lower or block the blades of bulldozers, scrapers, and similar equipment before you make repairs or when the equipment is not in use.

NOTES:

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## **C. Protect yourself from being pinned between equipment, materials, or other objects**

- Be aware at all times of the equipment around you and stay a safe distance from it.
- Never place yourself between moving materials and an immovable structure, vehicle, or stacked materials
- Make sure that all loads carried by equipment are stable and secured
- Stay out of the swing radius of cranes and other equipment.
- Wear a seatbelt, if required, to avoid being thrown from a vehicle and then potentially being crushed by the vehicle if it tips over

## **D. Protect yourself on excavation sites**

- Do not work in an unprotected trench that is 5 feet deep or more. The type of protection may be one of the following:
  - Sloping or benching. Sloping is cutting back the sides of the trench to a safe angle so it won't collapse. Benching uses a series of steps that approximate the safe sloping angle. The angle depends on the soil type.
  - Trench box or shield. These do not prevent cave-ins but protect the workers who are in them if a cave-in happens.
  - Shoring. Shoring are wooden structures or mechanical or hydraulic systems that support the sides of an excavation.
- Enter or exit a trench or excavation only by using a ladder, stairway or properly designed ramp that is placed within the protected area of the trench.
- Do not work outside of the confines of the protection system!

## **E. Training**

Make sure you have the proper training on the equipment and hazards of your job so that you can do your work safely.

NOTES:

# Construction Focus Four: Caught-In or -Between Hazards

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## Topic 4. What is my employer required to do to protect workers from caught-in or –between hazards?

- A. Provide guards on power tools and other equipment with moving parts
- B. Support, secure or otherwise make safe equipment having parts that workers could be caught between
- C. Take measures to prevent workers from being crushed by heavy equipment that tips over
- D. Take measures to prevent workers from being pinned between equipment and a solid object
- E. Provide protection for workers during trenching and excavation work
- F. Provide means to avoid the collapse of structures scaffolds
- G. Provide means to avoid workers' being crushed by collapsing walls during demolition or other construction activities
- H. Designate a competent person
- I. Provide training for workers

### CONTENT for Topic 4:

#### A. Provide guards on power tools and other equipment with moving parts

OSHA standards require your employer to ensure that hand-held power tools are fitted with guards and safety switches. The type of guard will be determined by the power source of the tool (electric, pneumatic, liquid fuel, hydraulic, or powder-actuated). Exposed moving parts of power tools, such as belts, gears, shafts, pulleys, etc. must be guarded. Points-of-operation – where the work is actually performed on the materials – must also be guarded. Power saws are a primary type of equipment that requires a point-of-operation guard. In-running nip points, such as where the sanding belt runs onto a pulley in a belt sanding machine, must also be guarded.

#### NOTES:

This section highlights selected requirements only and is not a comprehensive coverage of the standards.

OSHA construction standards that have requirements designed to reduce the occurrence of caught-in or –between hazards can be found in 29 CFR 1926:

- Subpart I – Tools – Hand and Power;
- Subpart L – Scaffolds;
- Subpart N – Cranes, Derricks, Hoists, Elevators, and Conveyors;
- Subpart O – Motor Vehicles, Mechanical Equipment, and Marine Operations;
- Subpart P – Excavations;
- Subpart Q – Concrete and Masonry Construction;
- Subpart W – Rollover Protective Structures; Overhead Protection; and
- Subpart T – Demolition

Guards are also required on other equipment with moving parts, such as chain drives on cranes, to which workers may be exposed.

## Construction Focus Four: Caught-In or -Between Hazards

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### **B. Support, secure or otherwise make safe equipment having parts that workers could be caught between**

- Your employer should provide a lock-out/tag-out program or equivalent system to ensure that equipment is not accidentally energized during maintenance or repair. Lockout/tagout procedures are specifically required for equipment used in concrete and masonry operations.
- Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment must be blocked or fully lowered when being repaired or not in use.

### **C. Take measures to prevent workers being crushed by heavy equipment that tips over**

- The best way to prevent workers being crushed by heavy equipment that tips over is to prevent the equipment from tipping over in the first place. For examples, cranes can tip over if the load capacity is exceeded, or the ground is not level or too soft. OSHA requires that your employer designate a competent person to inspect crane operations to identify working conditions that are hazardous to workers, including ensuring that the support surface is firm and able to support the load.
- Your employer must make sure that material handling equipment is equipped with rollover protective structures.
- OSHA standards require that motor vehicles, forklifts, and earthmoving equipment must be equipped with seat belts. Your employer must require their use. The use of seat belts will prevent workers being thrown from a vehicle or equipment and subsequently being crushed when the vehicle or equipment tips over.

NOTES:

## Construction Focus Four: Caught-In or -Between Hazards

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### **D. Take measures to prevent workers from being pinned between equipment and a solid object**

Employers are required to take measures to prevent workers from being pinned between equipment and a solid object, such as a wall or another piece of equipment; between materials being stacked or stored and a solid object, between shoring and construction materials in a trench.

Other example situations are:

- During demolition operations, when balling or clamming is being performed, only the personnel absolutely necessary to the work must be allowed in the work area.
- Your employer must make sure that proper bracing is used between heavy plates used as shoring in a trench.
- Your employer must carefully arrange the path of travel when loading/unloading, stacking, and storing materials so that no workers will be caught between materials and moving equipment or between materials and a wall.

### **E. Provide protection for workers during trenching and excavation work**

- OSHA standards on trenching and excavation require your employer to designate a competent person to inspect the trenching operations. The competent person must be trained in and knowledgeable about soils classification, the use of protective systems, and the requirements of the OSHA standard. The competent person must be capable of identifying hazards, and authorized to immediately eliminate hazards.

NOTES:

## Construction Focus Four: Caught-In or -Between Hazards

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- The employer must make sure all excavations and trenches 5 feet deep or more, but less than 20 feet, are protected by: sloping or benching, trench box or shield, or shoring, and that there are adequate means of access and egress from the excavation.
- If an excavation is more than 20 feet deep, a professional engineer must design the system to protect the workers.
- Workers must be protected from equipment or materials that could fall or roll into excavations. This could include spoils that could fall into the trench and bury the workers.
- Mobile equipment used near or over an excavation presents a hazard. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system must be utilized such as barricades, hand or mechanical signals or stop logs. If possible, the grade should be away from the excavation.
- If a crane or earthmoving equipment is operating directly over the top of a trench, workers should not be working underneath.

NOTES:

## Construction Focus Four: Caught-In or -Between Hazards

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### **F. Provide means to avoid the collapse of structures scaffolds**

- Measures need to be taken by your employer to avoid the collapse of other structures, such as scaffolds, that could bury workers underneath them.
- Anytime there is inadequate support, improper construction, or a shift in the components of a scaffold (including the base upon which the structure is built), there is danger of collapse. Cinder blocks or other similar materials should not be used to support a scaffold because they could be crushed. OSHA standards require that scaffolds can only be erected, moved, dismantled or altered under the supervision of a competent person. The competent person selects and directs the workers who erect the scaffold. These workers must be trained by a competent person on correct procedures and hazards of scaffold erection.

### **G. Provide means to avoid workers' being crushed by collapsing walls during demolition or other construction activities**

- During demolition, any stand-alone wall that is more than one story must have lateral bracing, unless the wall was designed to be stand-alone and is otherwise in a safe condition to be self-supporting.
- Jacks must have a firm foundation. If necessary, the base of a jack must be blocked or cribbed. After a load has been raised, it must be cribbed, blocked, or otherwise secured at once.

NOTES:



# Construction Focus Four: Caught-In or -Between Hazards

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## H. Designate a competent person

- OSHA defines a “competent person” as “one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.”
- Your employer must designate a competent person for certain construction activities that may have caught-in or –between hazards:
  - Training for scaffold erection
  - Inspections of excavations, the adjacent areas, and protective systems
  - Engineering survey prior to demolition of a structure (and any adjacent structure where workers may be exposed) to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse
  - Continuing inspections during demolition to detect hazards resulting from weakened or deteriorated floors, or walls, or loosened material

## I. Provide training for workers

- OSHA’s general training requirement for construction workers is:
  - The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.
- Your employer must train you to perform your job and use the provided equipment safely.
- Construction activities that may have caught-in or –between hazards and that have specific training requirements in OSHA standards include
  - Scaffolds – workers who are involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold

NOTES:

# Construction Focus Four: Caught-In or -Between Hazards

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## Summary

During this lesson, you have been given an overview of common caught-in or –between hazards, ways to protect yourself, and what employers must do to protect workers from caught-in or –between hazards.

## Conduct lesson test

Distribute student copies and allow time for students to complete the test. When they have finished, provide and discuss the correct answers with the class.

**Thank participants** for their time, attention, and involvement in the session.

## NOTES:

Instructor answer key and student copies of the lesson test are provided in Appendix A.

# Construction Focus Four: Caught-In or -Between Hazards

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## References/Sources

OSHA Website

BLS Website

CDC/NIOSH Website

The Construction Chart Book (CPWR, 2007)

Central New York COSH, 2007, Construction Safety & Health Caught-in or -between hazards Grantee module, Grant Number SH-16586-07-06-F-36 from OSHA

CDC/NIOSH in partnership with CPWR-The Center for Construction Research and Training, Hollywood, Health and Society, and the Spanish-language network Telemundo, <http://www.cdc.gov/Features/ConstructionFalls/>

## Construction Focus Four: Caught-In or -Between Hazards

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## Construction Focus Four: Caught-In or -Between Hazards

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## APPENDIX A

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### Appendix A: Caught-In or -Between Hazards Lesson Test

**Instructor Copy - *answers provided separately***  
**See file: CaughtlorB\_TestwAns\_April2011.pdf**

*Student copy to distribute follows*

## APPENDIX A

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## Construction Focus Four: Caught-In or -Between Hazards Lesson Test

NAME: \_\_\_\_\_

DATE: \_\_/\_\_/\_\_

1. Caught in or -between hazards are related with excavations [trenches]; therefore, the hazard considered to be the greatest risk is:
  - a. Cave-ins
  - b. Severing of underground utilities
  - c. Equipment falling into trenches
  
2. One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them is a/n \_\_\_\_\_:
  - a. Competent person
  - b. OSHA Compliance Officer
  - c. Qualified person
  
3. To protect against caught-in or –between hazards, a worker should not only avoid wearing loose clothing or jewelry, but also a worker should avoid:
  - a. Operating equipment/machinery while wearing a seatbelt
  - b. Working with equipment/machinery that has not been locked-out
  - c. Using equipment/machinery that is guarded
  
4. Providing worker training on the safe use of the equipment being operated is the responsibility of the:
  - a. Employer
  - b. Worker
  - c. State OSHA consultation
  
5. Workers should not work in an unprotected trench that is 5 feet deep or more. The type of protection installed may be sloping or benching; trench box or shield; and \_\_\_\_\_.
  - a. Stabilizing
  - b. Steadying
  - c. Shoring
  
6. To prevent being pinned between equipment or other objects, workers should avoid \_\_\_\_\_.
  - a. Using a trench box or shield during excavation work
  - b. Placing themselves between moving vehicles and an immovable structure, vehicle, or staked materials
  - c. Removing a safety guard when a tool such as, a circular saw or power drill, is being used.





## APPENDIX B

### Appendix B: Review Exercise REVIEW EXERCISE ANSWER SHEET

Complete the following sentences using words from the word bank.

#### WORD BANK

1- Safety guard	7a- Identifying	2b- 5 feet	
2a- Cave-in	5b- Stacked	7b- Corrective	4- Secured
6- Equipment	5a- Immovable	3- Seatbelt	

Each word will be used once.

1. To protect yourself from hazardous moving parts of power tools and equipment, always use a/n Safety guard<sub>1</sub> when using the equipment.
2. To avoid being caught in a/n Cave-in<sub>2a</sub>, do not work in an unprotected trench that is 5 feet<sub>2b</sub> deep or more
3. Wear a/n Seatbelt<sub>3</sub>, if required, to avoid being thrown from a vehicle and then crushed by the vehicle as it tips over.
4. Make sure all loads carried by equipment are stable and Secured<sub>4</sub>.
5. Never place yourself between moving materials and a/n Immovable<sub>5a</sub> structure, vehicle, or Stacked<sub>5b</sub> materials.
6. Your employer must train you on how to use any provided Equipment<sub>6</sub> safely.
7. A competent person is capable of Identifying<sub>7a</sub> hazards in the work environment and is authorized to take Corrective<sub>7b</sub> measures.

## APPENDIX B

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NAME: \_\_\_\_\_

DATE: \_\_/\_\_/\_\_

### REVIEW EXERCISE – STUDENT COPY

Complete the following sentences using words from the word bank.

WORD BANK			
<b>Safety guard</b>		<b>Identifying</b>	<b>5 feet</b>
<b>Cave-in</b>	<b>Stacked</b>	<b>Corrective</b>	<b>Secured</b>
<b>Equipment</b>		<b>Immovable</b>	<b>Seatbelt</b>

**Each word will be used once.**

1. To protect yourself from hazardous moving parts of power tools and equipment, always use a/n \_\_\_\_\_ when using the equipment.
2. To avoid being caught in a/n \_\_\_\_\_, do not work in an unprotected trench that is \_\_\_\_\_ deep or more.
3. Wear a/n \_\_\_\_\_, if required, to avoid being thrown from a vehicle and then crushed by the vehicle as it tips over.
4. Make sure all loads carried by equipment are stable and \_\_\_\_\_.
5. Never place yourself between moving materials and a/n \_\_\_\_\_ structure, vehicle, or \_\_\_\_\_ materials.
6. Your employer must train you on how to use any provided \_\_\_\_\_ safely.
7. A competent person is capable of \_\_\_\_\_ hazards in the work environment and is authorized to take \_\_\_\_\_ measures.



## APPENDIX C

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### Appendix C: Student Handouts

#### Contents:

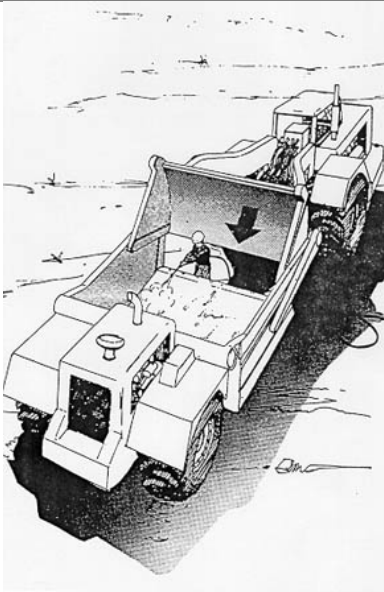
- Fatal Facts Accident Summary #5
- Fatal Facts Accident Summary #13
- Fatal Facts Accident Summary #15
- Fatal Facts Accident Summary #18
- Fatal Facts Accident Summary #22
- Fatal Facts Accident Summary #31
- Fatal Facts Accident Summary #38
- Fatal Facts Accident Summary #50
- Fatal Facts Accident Summary #61
- Fatal Facts Accident Summary #73

## APPENDIX C

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## APPENDIX C

### ACCIDENT SUMMARY No. 5

Accident Type:	Caught in or Between	
Weather Conditions:	Clear	
Type of Company:	Street Paving Contractor	
Size of Work Crew:	1	
Union or Non-union:	Non-Union	
Worksite Inspections Conducted (1926.20(b)(2)):	Yes	
Designated Competent Person on Site (1926.20(b)(2)):	Yes	
Employer Safety Health Program:	Yes	
Training and Education for Employees (1926.21(b)):	Yes	
Craft of Deceased Employee(s):	Ironworker	
Age & Sex:	22-Male	
Time on the Job:	1 day	
Time on Task:	3 Hours	

### BRIEF DESCRIPTION OF ACCIDENT

A laborer was steam cleaning a scraper. The bowl apron had been left in the raised position. The hydraulically controlled apron had not been blocked to prevent it from accidentally falling. The apron did fall unexpectedly and the employee was caught between the apron and the cutting edge of the scraper bowl. The apron weighted approximately 2500 pounds.

### INSPECTION RESULTS\*

Following its inspection, OSHA issued two citations for violations of its construction standards. Had the employees been properly trained and the equipment been properly lowered or blocked, this fatality might have been prevented

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Employer shall instruct each employee to recognize and avoid unsafe conditions applicable to his work environment (29 CFR 1926.21(b)(2)).
2. Bulldozer and scraper blades and similar equipment shall either be fully lowered or blocked when being repaired or not in use (29 CFR 1926.600(a)(3)(i)).

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

\*Note: Inspection Results added to original document.



## APPENDIX C

### ACCIDENT SUMMARY No. 13

<b>Accident Type:</b>	Collapse of Shoring	
<b>Weather Conditions:</b>	Clear	
<b>Type of Operation:</b>	Boring and Pipe Jacking Excavation	
<b>Size of Work Crew:</b>	4	
<b>Collective Bargaining</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	No	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	Yes	
<b>Employee Job Title:</b>	Pipe Welder	
<b>Age &amp; Sex:</b>	62-Male	
<b>Experience at this Type of Work:</b>	18 years	
<b>Time on Project:</b>	2½	

### BRIEF DESCRIPTION OF ACCIDENT

Four employees were boring a hole and pushing a 20-inch pipe casing under a road. The employees were in an excavation approximately 9 feet wide, 32 feet long and 7 feet deep. Steel plates 8' x 15' x ¾", being used as shoring, were placed vertically against the north and south walls of the excavation at approximately a 30 degree angle. There were no horizontal braces between the steel plates. The steel plate on the south wall tipped over, pinning an employee (who was killed ) between the steel plate and the pipe casing. At the time the plate tipped over, a backhoe was being operated adjacent to the excavation.

### INSPECTION RESULTS

As a result of its investigation, OSHA issued a citation for two alleged serious violations of its construction standards. OSHA's construction safety standards include several requirements which, if they had been followed here, might have prevented this fatality.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Provide an adequately constructed and braced shoring system for employees working in an excavation that may expose employees to the danger of moving ground (29 CFR 1926.651(a)(1)).
2. If heavy equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to superimposed loads (29 CFR 1926.652(c)(1)).

### SOURCES OF HELP

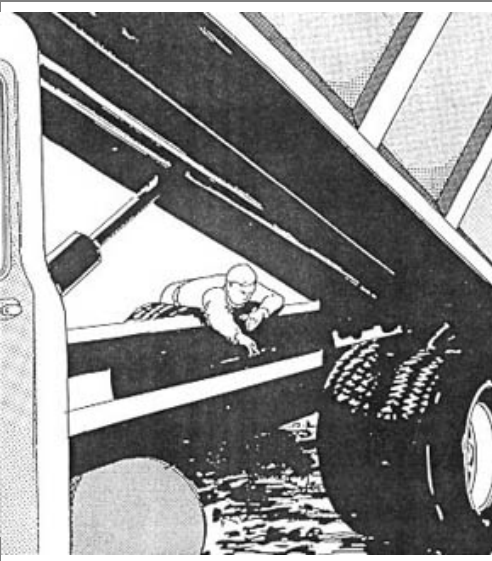
- Construction Safety and Health Standards (OSHA 2207) which contains all OSHA job safety and health rules and regulations covering construction.
- Excavation and Trenching Operations (OSHA 2226) which details OSHA excavation and trenching standards
- Safety and Health in Excavation and Trenching Operations (available from the National Audiovisual Center - Order No 689601 ), an instructional program with instructor's manual and 139 slides designed to provide greater knowledge and understanding of hazards in excavation and trenching.

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

NOTE: Standard citation numbers have been changed from the original document to conform to the revised Subpart P – Excavations.

## APPENDIX C

### ACCIDENT SUMMARY No. 15

<b>Accident Type:</b>	Crushed by Dump Truck Body	
<b>Weather Conditions:</b>	Clear, Warm	
<b>Type of Operation:</b>	General Contractor	
<b>Size of Work Crew:</b>	N/A	
<b>Collective Bargaining:</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	Yes	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Truck Driver	
<b>Age &amp; Sex:</b>	25-Male	
<b>Experience at this Type of Work:</b>	2 Months	
<b>Time on Project:</b>	2 Weeks at Site	

### BRIEF DESCRIPTION OF ACCIDENT

A truck driver was crushed and killed between the frame and dump box of a dump truck. Apparently a safety "overtravel" cable attached between the truck frame and the dump box malfunctioned by catching on a protruding nut of an air brake cylinder. This prevented the dump box from being fully raised, halting its progress at a point where about 20 inches of space remained between it and the truck frame. The employee, apparently assuming that releasing the cable would allow the dump box to continue up-ward, reached between the rear dual wheels and over the frame, and disengaged the cable with his right hand. The dump box then dropped suddenly, crushing his head. The employee had not received training or instruction in proper operating procedures and was not made aware of all potential hazards in his work.

### INSPECTION RESULTS

Following its inspection, OSHA issued one citation for one alleged serious violation of its construction standards. Had the required training been provided to the employee, this fatality might have been prevented.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Employees must be instructed to recognize and avoid unsafe conditions associated with their work (29 CFR 1926.21(b)(2)).

### SOURCES OF HELP

- Construction Safety and Health Standards (OSHA 2207) which contains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction. OSHA-funded free consultation services.
- Consult your telephone directory for the number of your local OSHA area or regional office for further assistance and advice (listed under U.S. Labor Department or under the state government section where states administer their own OSHA programs).

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

## APPENDIX C

### ACCIDENT SUMMARY No. 18

<b>Accident Type:</b>	Caught by Rotating Part
<b>Weather Conditions:</b>	Clear
<b>Type of Operation:</b>	Telephone Line Installation
<b>Size of Work Crew:</b>	3
<b>Collective Bargaining</b>	No
<b>Competent Safety Monitor on Site:</b>	Yes - Victim
<b>Safety and Health Program in Effect:</b>	Yes
<b>Was the Worksite Inspected Regularly:</b>	Yes
<b>Training and Education Provided:</b>	No
<b>Employee Job Title:</b>	Boring Machine Operator
<b>Age &amp; Sex:</b>	56-Male
<b>Experience at this Type of Work:</b>	10 Years
<b>Time on Project:</b>	5 Days



### BRIEF DESCRIPTION OF ACCIDENT.

A three-man crew was installing an underground telephone cable in a residential area. They had just completed a bore hole under a driveway using a horizontal boring machine. The bore hole rod had been removed from the hole. While the rod was still rotating, the operator straddled it and stooped over to pick it up. His trouser leg became entangled in the rotating rod and he was flipped over. He struck tools and materials, sustaining fatal injuries.

### INSPECTION RESULTS

Following its inspection, OSHA issued one citation for one alleged serious violation of its construction standards. Had the equipment been properly guarded, this fatality might have been prevented.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Employees must be instructed to recognize and avoid unsafe conditions associated with their work (29 CFR 1926.21(b)(2)).
2. Guards must be installed on moving parts of equipment with which employees may come into contact (29 CFR 1926.300(b)(2)).

### SOURCES OF HELP

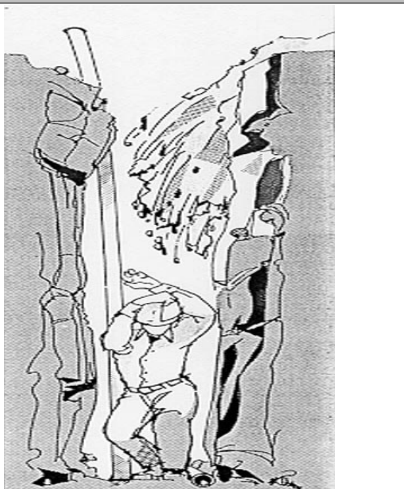
- Construction Safety and Health Standards (OSHA 2207) which maintains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction.
- OSHA-funded free consultation services. Consult your telephone directory for the number of your local OSHA area or regional office for further assistance and advice (listed under U.S. Labor Department or under the state government section where states administer their own OSHA programs).

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

## APPENDIX C

### ACCIDENT SUMMARY No. 22

<b>Accident Type:</b>	Cave-in
<b>Weather Conditions:</b>	Warm, Clear
<b>Type of Operation:</b>	Excavator
<b>Size of Work Crew:</b>	2
<b>Collective Bargaining</b>	No
<b>Competent Safety Monitor on Site:</b>	Yes
<b>Safety and Health Program in Effect:</b>	No
<b>Was the Worksite Inspected Regularly:</b>	Yes
<b>Training and Education Provided:</b>	No
<b>Employee Job Title:</b>	Laborer
<b>Age &amp; Sex:</b>	37-Male
<b>Experience at this Type of Work:</b>	3 Years
<b>Time on Project:</b>	2 Days



### BRIEF DESCRIPTION OF ACCIDENT

An employee was installing a small diameter pipe in a trench 3 feet wide, 12-15 feet deep and 90 feet long. The trench was not shored or sloped nor was there a box or shield to protect the employee. Further, there was evidence of a previous cave-in. The employee apparently reentered the trench, and a second cave-in occurred, burying him. He was found face down in the bottom of the trench.

### INSPECTION RESULTS

Following its inspection, OSHA issued a citation for three serious violations of its construction standards. Had the required support been provided for the trench, it might not have collapsed.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Employers must shore, slope, or otherwise support the sides of trenches to prevent their collapse (29 CFR 1926.652(a)(1)).
2. Employers must protect employees with adequate personal protective equipment (29 CFR 1926.95(a)).
3. Employers must provide an adequate means of exit from trenches (29 CFR 1926.651(c)(2)).
4. Employees must be instructed to recognize and avoid unsafe conditions associated with their work (29 CFR 1926.21(b)(2)).

### SOURCES OF HELP

- Construction Safety and Health Standards (OSHA 2207) which contains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction.
- Excavation and Trenching Operations (OSHA 2226), is a 20-page booklet describing pertinent OSHA standards in detail.
- Safety and Health Excavation and Trenching Operations, available from the National Audiovisual Center (NAC) (Order No. 689601, \$60), an instructional program designed to increase awareness and understanding of the problems and hazards in excavation and trenching operations. It includes an instructor's guide and 139 slides.
- Trenching, also available from NAC (Order No. 007516, \$40), a slide-tape hazard recognition program including 96 slides, instructor's guide, workbook and course outline.
- Sloping, Shoring, and Shielding, a one-day instructional program with classroom session and hands-on workshop, Available from NAC (Order No. 009863, \$30), the package includes an instructor's manual, outline for field exercise/workshop and 60 slides.


**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

NOTE: Standard citation numbers have been changed from the original document to conform to the revised Subpart P – Excavations.



## APPENDIX C

### ACCIDENT SUMMARY No. 31

<b>Accident Type:</b>	Cave-in	
<b>Weather Conditions:</b>	Cloudy and Dry	
<b>Type of Operation:</b>	Trenching and excavation	
<b>Size of Work Crew:</b>	4	
<b>Collective Bargaining</b>	No	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	Yes	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Pipe Layer	
<b>Age &amp; Sex:</b>	32-Male	
<b>Experience at this Type of Work:</b>	9 Months	
<b>Time on Project:</b>	2 Weeks	

**BRIEF DESCRIPTION OF ACCIDENT:** Employees were laying sewer pipe in a trench 15 feet deep. The sides of the trench, 4 feet wide at the bottom and 15 feet wide at the top, were not shored or protected to prevent a cave-in. Soil in the lower portion of the trench was mostly sand and gravel and the upper portion was clay and loam\*. The trench was not protected from vibration caused by heavy vehicle traffic on the road nearby. To leave the trench, employees had to exit by climbing over the backfill. As they attempted to leave the trench, there was a small cave-in covering one employee to his ankles. When the other employee went to his co-worker's aid another cave-in occurred covering him to his waist. The first employee died of a rupture of the right ventricle of his heart at the scene of the cave-in. The other employee suffered a hip injury.

**INSPECTION RESULTS:** Following investigation, citations were issued alleging three willful, four serious and two non-serious violations of construction standards. Had the trench been shored to prevent slides or cave-ins and had employees been trained to recognize and avoid unsafe conditions, the accident could have been prevented.

#### ACCIDENT PREVENTION RECOMMENDATIONS:

1. Employers must instruct employees on how to recognize and avoid hazardous conditions and on regulations applicable to the work environment (29 CFR 1926.21(b)(2)).
2. Excavated and other materials must be effectively stored and retained at least two feet from the edge of the excavation (29 CFR 1926.651(j)(2)).
3. The employer must ensure that the walls or side of trenches in unstable or soft material 5 feet or more in depth, be shored, sheeted, braced, sloped, or protected in some manner to prevent cave-ins and to protect employees required to work within them (29 CFR 1926.652(a)(1)).
4. When excavations are subjected to vibrations from highway traffic, additional precautions must be taken to prevent cave-ins (29 CFR 1926.652(c)(1)).
5. Ladders must be provided as a means of exit when employees are required to be in trenches 4 or more feet deep (29 CFR 1926.652(c)(2)).

**SOURCES OF HELP:** Construction Safety and Health Standards (OSHA 2207) which contains all OSHA job safety and health rules and regulations covering construction.

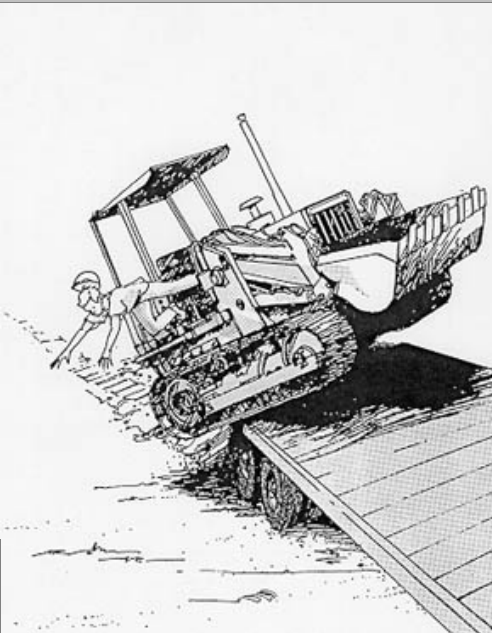
OSHA-funded free consultation services. Consult your telephone directory for the number of your local OSHA area or regional office for further assistance and advice (listed under U.S. Labor Department or under the state government section where states administer their own OSHA programs).; -OSHA Safety and Health Training Guidelines for Construction (available from the National Technical Information Service Order No. PB-239-312/AS) comprised of a set of 15 guidelines to help construction employees establish a training program in the safe use of equipment, tools, and machinery on the job.; -Excavation and Trenching Operations (OSHA 2226), is a 20 page booklet describing pertinent OSHA standards in detail.; Sloping, Shoring, and Shielding, a one-day instructional program with classroom session and hands-on workshop. Available from NAC (Order No. 009863, \$30), the package includes an instructor's manual, outline for field exercise/workshop and 60 slides;

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed. NOTE: Standard citation numbers have been changed from the original document to conform to the revised Subpart P – Excavations.

\*Clay and loam are terms not used any longer; Soil condition is now described using A, B, or C

## APPENDIX C

### ACCIDENT SUMMARY No. 38

<b>Accident Type:</b>	Caught in or between	
<b>Weather Conditions:</b>	Clear, dry	
<b>Type of Operation:</b>	Highway, street construction	
<b>Size of Work Crew:</b>	4	
<b>Collective Bargaining:</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	Yes	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Equipment Operator	
<b>Age &amp; Sex:</b>	38-Male	
<b>Experience at this Type of Work:</b>	11 Months	
<b>Time on Project:</b>	1 Hour	

### BRIEF DESCRIPTION OF ACCIDENT

An employee was driving a front-end loader up a dirt ramp onto a lowboy trailer. The tractor tread began to slide off the trailer. As the tractor began to tip, the operator, who was not wearing a seat belt, jumped from the cab. As he hit the ground, the tractor's rollover protective structure fell on top of him, crushing him.

### INSPECTION RESULTS

Following its inspection, OSHA cited the employer for two serious violations and one other than serious violation. Had the front-end loader been equipped with seat belts and had the employee worn them, he might not have been killed.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Provide seat belts in material handling equipment which has rollover protective structures (29 CFR 1926.602(a)(2)(I)).
2. Instruct employees to recognize and avoid unsafe conditions associated with their work (29 CFR 1926.21(b)(2)).
3. Permit only employees qualified by training or experience to operate equipment and machinery (29 CFR 1926.20(b)(4)).


### SOURCES OF HELP

- Construction Safety and Health Standards (OSHA 2207) which contains all OSHA job safety and health rules and regulations (1926 and 1910) covering construction.
- OSHA-funded free onsite consultation services. Consult your telephone directory for the number of your local OSHA area or regional office for further assistance and advice (listed under the U.S. Labor Department or under the state government section where states administer their own OSH programs).

NOTE: The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

## APPENDIX C

### ACCIDENT SUMMARY No. 50

<b>Accident Type:</b>	Caught between Backhoe Superstructure and Concrete Wall	
<b>Weather Conditions:</b>	Clear/Cool	
<b>Type of Operation:</b>	Excavation Contractor	
<b>Size of Work Crew:</b>	9	
<b>Collective Bargaining:</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	No	
<b>Safety and Health Program in Effect:</b>	No	
<b>Was the Worksite Inspected Regularly:</b>	No	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Truck Driver	
<b>Age &amp; Sex:</b>	34-Male	
<b>Experience at this Type of Work:</b>	Unknown	
<b>Time on Project:</b>	4 Days	

*Picture used may not be representative of a backhoe as indicated in the report*

### BRIEF DESCRIPTION OF ACCIDENT

The contractor was operating a backhoe when an employee attempted to walk between the swinging superstructure of the backhoe and a concrete wall. As the employee approached the backhoe from the operator's blind side, the superstructure hit the victim crushing him against the wall.

### INSPECTION RESULTS

OSHA issued two citations to the employer. One was based on failure to train employees in safe work practices regarding the dangers of construction machinery. The other citation was for failure to erect barricades to prevent entry into a swinging superstructure's radius.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Instruct each employee on the danger of passing between swinging superstructures of large construction equipment and solid objects at the demolition site [29 CFR 1926.21(b)(2)].
2. Provide each employee employment and place of employment which are free from recognized hazards causing or likely to cause death or serious physical harm to his employees [OSH Act Sec. 5(a)(1)].


### SOURCES OF HELP

- OSHA General Industry Standards [CFR parts 1900-1910] and OSHA Construction Standards [CFR Part 1926] which together include all OSHA job safety and health rules and regulations covering construction.
- OSHA-funded free consultation services listed in telephone directories under U.S. Labor Department or under the state government section where states administer their own OSHA programs.
- OSHA Safety and Health Training Guidelines for Construction (Available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; 703/487-4650; Order No. PB-239-312/AS): a set of 15 guidelines to help construction employers establish a training program in the safe use of equipment, tools, and machinery on the job

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

## APPENDIX C

### ACCIDENT SUMMARY No. 61

<b>Accident Type:</b>	Trench Collapse	
<b>Weather Conditions:</b>	Fair	
<b>Type of Operation:</b>	Excavation Work	
<b>Size of Work Crew:</b>	2	
<b>Competent Safety Monitor on Site:</b>	No	
<b>Safety and Health Program in Effect:</b>	No	
<b>Was the Worksite Inspected Regularly:</b>	No	
<b>Training and Education Provided:</b>	Inadequate	
<b>Employee Job Title:</b>	Laborer	
<b>Age &amp; Sex:</b>	51-Male	
<b>Experience at this Type of Work:</b>	6 Months	
<b>Time on Project:</b>	2 Days	

### BRIEF DESCRIPTION OF ACCIDENT

An employee was working in a trench 4 feet wide and 7 feet deep. About 30 feet away a backhoe was straddling the trench when the backhoe operator noticed a large chunk of dirt falling from the side wall behind the worker in the trench, he called out a warning. Before the worker could climb out, 6 to 8 feet of the trench wall had collapsed on him and covered his body up to his neck. He suffocated before the backhoe operator could dig him out. There were no exit ladders. No sloping, shoring or other protective system had been used in the trench.

### INSPECTION RESULTS

As a result of its investigation, OSHA issued citations alleging three serious violations. OSHA's construction standards include several requirements which, if they had been followed here, might have prevented this fatality.

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to the work environment [29 CFR 1926.21(b)(2)].
2. Provide protection from cave-ins by an adequate protective system [29 CFR 1926.652(a)(1)].
3. Provide a means of egress within 25 feet of employees in a trench 4 feet or more deep, such as a ladder or stairway [29 CFR 1926.651(c)(2)].

### SOURCES OF HELP


- Title 29 Code of Federal Regulations (CFR) Part 1926 -- OSHA construction standards, in particular Subpart P Excavations. The OSHA standards are available at [www.osha.gov](http://www.osha.gov)
- For Information on OSHA-funded **free consultation services** use the A-Z index to find state locate "Consultation Services" at [www.osha.gov](http://www.osha.gov).
- For information about construction resources **use the A-Z index to find the construction page** at [www.osha.gov](http://www.osha.gov)
- For the "**Small Business Handbook**" use the A-Z index to find its link at [www.osha.gov](http://www.osha.gov)
- Courses in construction safety are offered by the OSHA's Directorate of Training and Education. Course and contact information is listed at [www.osha.gov](http://www.osha.gov) under the Training tab.

**NOTE:** The case described above was selected as an example of fatalities caused by violations of OSHA's construction standards, particularly the excavation and trenching standards. No special emphasis or priority is implied nor is the case necessarily a recent one. The legal aspects of OSHA's citations have been resolved, and its case is now closed.



## APPENDIX C

### ACCIDENT SUMMARY No. 73

Accident Type:	Struck by/Caught between	
Weather Conditions:	Clear/warm	
Type of Operation:	Stacking Structural Steel	
Size of Work Crew:	6	
Competent Person on Site:	No	
Safety and Health Program in Effect:	No	
Was the Worksite Inspected Regularly by the Employer:	No	
Training and Education Provided:	No	
Employee Job Title:	Laborer	
Age & Sex:	28-Male	
Experience at this Type of Work:	4 Years	
Time on Project:	5 Weeks	

### BRIEF DESCRIPTION OF ACCIDENT

Two laborers and a fork lift driver were staking 40-foot-long I-beams in preparation for structural steel erection. One laborer was placing a 2 X 4 inch wooden spacer on the last I-beam on the stack. The fork lift driver drove up to the stack with another I-beam that was not secured or blocked on the fork lift tines. The I-beam fell from the tines, pinning the laborer between the fallen I beam and the stack of beams.

### INSPECTION RESULTS

As a result of its investigation, OSHA issued citations for two serious violations of OSHA standards.

### ACCIDENT PREVENTION RECOMMENDATIONS

The employer must:

1. Instruct each employee in the recognition and avoidance of unsafe conditions and regulations applicable to the work environment to control or eliminate any hazards (29 CFR 1926.21(b)(2)).
2. Ensure that proper personal equipment (employee did not wear a seat belt while operating the fork lift) is worn in all operations where there is exposure to hazardous conditions (29 CFR 1926.28(a)).
3. Ensure that powered industrial trucks have loads that are stable and secure and that persons are not allowed too close to the elevated portions (29 CFR 1926.602(c)(1)(vi)).
4. Ensure that the employer initiates and maintains a safety and health program (29 CFR 1926.20(b)(2)).

### SOURCES OF HELP

- OSHA Construction Standards (Title 29 Code of Federal Regulations (CFR) Part 1926) includes all OSHA job safety and health rules and regulations covering construction, may be purchased from the Government Printing Office, phone (202) 512-1800, fax (202) 512-2250, Order No. 869-032-00107-3, (\$31.00).
- OSHA-funded free consultation services listed in telephone directories under U.S. Labor Department or under the state government section where states administer their own OSHA programs.
- OSHA Safety and Health Training Guidelines for Construction, Volume III (Available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; phone (703) 487-4650; Order no. PB-239-312/AS; Cost \$25.) to help construction employers establish a training program.
- Courses in construction safety are offered by the OSHA Training Institute, 2020 S. Arlington Heights Rd., Arlington Heights, IL 60005.
- OSHA regulations, documents and technical information also are available on CD-ROM, which may be purchased from the Government Printing Office, phone (202) 512-1800 or fax (202) 512-2250, order number 729-13-00000-5; cost \$43 annually; \$17 quarterly. That information also is on the Internet World Wide Web at <http://www.osha.gov/>

**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

# ACCIDENT REPORT FATAL FACTS

## ACCIDENT SUMMARY No. 5

Accident Type:	Caught in or Between	
Weather Conditions:	Clear	
Type of Company:	Street Paving Contractor	
Size of Work Crew:	1	
Union or Non-union:	Non-Union	
Worksite Inspections Conducted (1926.20(b)(2)):	Yes	
Designated Competent Person on Site (1926.20(b)(2)):	Yes	
Employer Safety Health Program:	Yes	
Training and Education for Employees (1926.21(b)):	Yes	
Craft of Deceased Employee(s):	Ironworker	
Age & Sex:	22-Male	
Time on the Job:	1 day	
Time on Task:	3 Hours	

### BRIEF DESCRIPTION OF ACCIDENT

A laborer was steam cleaning a scraper. The bowl apron had been left in the raised position. The hydraulically controlled apron had not been blocked to prevent it from accidentally falling. The apron did fall unexpectedly and the employee was caught between the apron and the cutting edge of the scraper bowl. The apron weighted approximately 2500 pounds.

### ACCIDENT PREVENTION RECOMMENDATIONS

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# ACCIDENT REPORT FATAL FACTS

## ACCIDENT SUMMARY No. 13

<b>Accident Type:</b>	Collapse of Shoring	
<b>Weather Conditions:</b>	Clear	
<b>Type of Operation:</b>	Boring and Pipe Jacking Excavation	
<b>Size of Work Crew:</b>	4	
<b>Collective Bargaining</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	No	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	Yes	
<b>Employee Job Title:</b>	Pipe Welder	
<b>Age &amp; Sex:</b>	62-Male	
<b>Experience at this Type of Work:</b>	18 years	
<b>Time on Project:</b>	2½	

### BRIEF DESCRIPTION OF ACCIDENT

Four employees were boring a hole and pushing a 20-inch pipe casing under a road. The employees were in an excavation approximately 9 feet wide, 32 feet long and 7 feet deep. Steel plates 8' × 15' × ¾", being used as shoring, were placed vertically against the north and south walls of the excavation at approximately a 30 degree angle. There were no horizontal braces between the steel plates. The steel plate on the south wall tipped over, pinning an employee (who was killed) between the steel plate and the pipe casing. At the time the plate tipped over, a backhoe was being operated adjacent to the excavation.

### ACCIDENT PREVENTION RECOMMENDATIONS

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# ACCIDENT REPORT FATAL FACTS

## ACCIDENT SUMMARY No. 15

<b>Accident Type:</b>	Crushed by Dump Truck Body	
<b>Weather Conditions:</b>	Clear, Warm	
<b>Type of Operation:</b>	General Contractor	
<b>Size of Work Crew:</b>	N/A	
<b>Collective Bargaining</b>	Yes	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	Yes	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Truck Driver	
<b>Age &amp; Sex:</b>	25-Male	
<b>Experience at this Type of Work:</b>	2 Months	
<b>Time on Project:</b>	2 Weeks at Site	

### BRIEF DESCRIPTION OF ACCIDENT

A truck driver was crushed and killed between the frame and dump box of a dump truck. Apparently a safety "over-travel" cable attached between the truck frame and the dump box malfunctioned by catching on a protruding nut of an air brake cylinder. This prevented the dump box from being fully raised, halting its progress at a point where about 20 inches of space remained between it and the truck frame. The employee, apparently assuming that releasing the cable would allow the dump box to continue up-ward, reached between the rear dual wheels and over the frame, and disengaged the cable with his right hand. The dump box then dropped suddenly, crushing his head. The employee had not received training or instruction in proper operating procedures and was not made aware of all potential hazards in his work.

### ACCIDENT PREVENTION RECOMMENDATIONS

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# ACCIDENT REPORT FATAL FACTS

## ACCIDENT SUMMARY No. 31

<b>Accident Type:</b>	Cave-in	
<b>Weather Conditions:</b>	Cloudy and Dry	
<b>Type of Operation:</b>	Trenching and excavation	
<b>Size of Work Crew:</b>	4	
<b>Collective Bargaining</b>	No	
<b>Competent Safety Monitor on Site:</b>	Yes	
<b>Safety and Health Program in Effect:</b>	Yes	
<b>Was the Worksite Inspected Regularly:</b>	Yes	
<b>Training and Education Provided:</b>	No	
<b>Employee Job Title:</b>	Pipe Layer	
<b>Age &amp; Sex:</b>	32-Male	
<b>Experience at this Type of Work:</b>	9 Months	
<b>Time on Project:</b>	2 Weeks	

### BRIEF DESCRIPTION OF ACCIDENT

Employees were laying sewer pipe in a trench 15 feet deep. The sides of the trench, 4 feet wide at the bottom and 15 feet wide at the top, were not shored or protected to prevent a cave-in. Soil in the lower portion of the trench was mostly sand and gravel and the upper portion was clay and loam\*. The trench was not protected from vibration caused by heavy vehicle traffic on the road nearby. To leave the trench, employees had to exit by climbing over the backfill. As they attempted to leave the trench, there was a small cave-in covering one employee to his ankles. When the other employee went to his co-worker's aid another cave-in occurred covering him to his waist. The first employee died of a rupture of the right ventricle of his heart at the scene of the cave-in. The other employee suffered a hip injury.

### ACCIDENT PREVENTION RECOMMENDATIONS

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\*Clay and loam are terms not used any longer; Soil condition is now described using A, B, or C









