

OSHA Training Institute

# Construction Focus Four: Struck-By Hazards

INSTRUCTOR GUIDE



# Construction Focus Four: Struck-By Hazards

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## TRAINER PREPARATION GUIDANCE

The “Construction Focus Four: Struck-By 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: Struck-By 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 struck-by hazards in construction.

*Specifically, the student will be able to:*

**EO 1:** Identify common struck-by hazards

**EO 2:** Describe types of struck-by hazards

**EO 3:** Protect themselves from struck-by hazards

**EO 4:** Recognize employer requirements to protect workers from struck-by hazards

**Using the Slide Presentation:** The Microsoft PowerPoint® 2003 presentation file consists of struck-by 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.

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## Online Resources

Bureau of Labor Statistics, Census of Fatal Occupational Injuries <http://www.bls.gov/iif/oshcfoi1.htm>

Electronic Library of Construction Occupational Safety & Health materials, Struck-by Hazards - developed by CPWR, Center for Construction Research and Training, with funding from NIOSH NOTE: Materials may be copyrighted. <http://www.elcosh.org/en/browse/71/struck-by.html>

Nail Gun Safety, CPWR Hazard Alert

<http://www.cpw.com/hazpdfs/Nail%20Gun%20Safety%20pg%20flier%20FINAL.pdf>

NIOSH Safety and Health Topic: Construction Safety <http://www.cdc.gov/niosh/topics/constructionsafety/>

National Institute for Occupational Safety and Health (NIOSH) Publication No. 98-142 Preventing Worker Injuries and Deaths from Traffic-Related Motor Vehicle Crashes <http://www.cdc.gov/niosh/motralt.html>

OSHA Cranes and Derricks in Construction Final Rule, Compliance Assistance Fact Sheets <http://www.osha.gov/cranes-derricks/index.html> Fact Sheets include:

- Cranes and Derricks in Construction: Final Rule. Significant changes, requirements, and benefits for the new rule
- Cranes and Derricks in Construction: Assembly and Disassembly, Subpart CC
- Cranes and Derricks in Construction: Operator Qualification and Certification, Subpart CC
- Cranes and Derricks in Construction: Signal Person Qualification, Subpart CC
- Cranes and Derricks in Construction: Qualified Rigger, Subpart CC

OSHA Directorate of Construction: Highway Work Zones and Signs, Signals, and Barricades Topic Page [http://www.osha.gov/doc/highway\\_workzones/index.html](http://www.osha.gov/doc/highway_workzones/index.html)

OSHA Construction eTools:

- Scaffolding: <http://www.osha.gov/SLTC/etools/scaffolding/>
- Struck-by: <http://www.osha.gov/SLTC/etools/construction/struckby/mainpage.html>

OSHA Grant Product (SH-17792-08-60-F-48) Big Four Construction Hazards: Struck-by Hazards [http://www.osha.gov/dte/grant\\_materials/fy08/sh-17792-08/struck\\_by\\_english\\_r6.pdf](http://www.osha.gov/dte/grant_materials/fy08/sh-17792-08/struck_by_english_r6.pdf)

OSHA Small Business Handbook (includes self-inspection checklists) <http://www.osha.gov/Publications/smallbusiness/small-business.html>

OSHA Publication 3106, (1998) Concrete and Masonry Construction <http://www.osha.gov/Publications/3106.html>

OSHA Quick Cards (also available in Spanish) <http://www.osha.gov/OshDoc/quickcards.html>

Quick Cards related to struck-by hazards include:

- Aerial Lifts
- Chain Saw Safety Tips
- Construction Hazards (Top Four)
- Construction PPE
- Crane Safety
- Demolition
- Supported Scaffold Inspection Tips
- Supported Scaffold Safety Tips
- Work Zone Traffic Safety

OSHA Weekly Reports of Fatalities, Catastrophes, and Other Events:

[http://www.osha.gov/dep/fatcat/dep\\_fatcat.html](http://www.osha.gov/dep/fatcat/dep_fatcat.html)




# Construction Focus Four: Struck-By Hazards



## Overview

The purpose of this lesson is to provide workers with information that will enable them to recognize common struck-by 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 struck-by hazard?
2. What are the common types of struck-by hazards in construction?
3. How can I protect myself from struck-by hazards?
4. What is my employer required to do to protect workers from struck-by 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>▪ If activity files are used for hazard recognition, copy PPTinstrHazRecAlt_StruckBy_April2011.pdf and PPTstudentHazRecAlt_StruckBy_April2011.pdf</li></ul>	<ul style="list-style-type: none"><li>▪ Review Helpful References/Online Resources listed in this document</li><li>▪ Review OSHA Construction standards</li><li>▪ Review instructor materials on Fatal Facts Accident Report scenarios, test, and handouts</li><li>▪ Make student copies of test, classroom activity Option A or B, Fatal Facts #2, #4, #8, and #51 worksheets, and handouts found in the Appendices</li></ul>	<ul style="list-style-type: none"><li>▪ CPWR Hazard Alert – Nail Gun Safety</li><li>▪ Focus 4 “Cranes and Rigging” Construction Safety Council handout</li><li>▪ PPE for Worker Checklist</li></ul>

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## Instruction for this session:

1. Ask the class if they can give an example of a hazard on a construction site that could cause a worker to be struck-by. Discuss the examples with the class. Be sure that examples of the most common struck-by hazards (flying, falling, swinging and rolling) are covered.
2. Discuss “Content” sections of all topics.
3. Show photos of struck-by hazards and have the class identify the hazards shown 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, plan to conduct one of the following small group activities sometime during or at the end of this session:
  - Option A: A 36-year-old construction inspector for the county died when an asphalt dump truck backed over him. The inspector was wearing an orange reflective vest and hard-hat and the dump truck had a backup alarm that was functioning. The truck traveled approximately 770 feet in reverse.
  - Option B: A 56-year-old truck driver was crushed when a crane tipped over and the crane’s boom landed on the cab of the dump truck in which he was sitting. The crane had been lowering an empty 4-yard concrete bucket, while booming out.
5. Conduct the lesson test and discuss answers with the students

## NOTES:

Display photos of struck-by hazards to gain attention and briefly discuss purpose of lesson.

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\_StruckBy\_April2011.pdf and  
PPTstudentHazRecAlt\_StruckBy\_April2011.pdf

Distribute copies of the “PPTstudentHazRecAlt\_StruckBy\_April2011.pdf” to the class.

Tool Box Talks 1 and 2 are used for Option A or B. Distribute related worksheets if used. [Appendix B].  
Source: SH-16591-07-06-F-11  
IUOE National Training Fund  
Focus Four Toolbox Talks

Note: These are optional as there is a variety of interactions [Classroom Exercises] planned throughout this session as well.

Locate instructor and student copies of test in Appendix A.



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## Topic 1: What is a struck-by hazard?

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

### Content for Topic 1:

#### A. Definition

Struck-by injuries are produced by forcible contact or impact between the injured person and an object or piece of equipment. Having said that, it is important to point out that in construction, struck-by hazards can resemble caught-in or -between hazards.

There is a distinction which is best explained by looking at the key factor in making a determination between a *Caught* event and a *Struck* event, ask: Was it the impact of the object alone that caused the injury?

When the impact alone creates the injury, the event is considered as *Struck*. On the other hand, when the injury is created more as a result of crushing injuries between objects, the event is considered as *Caught*.

Struck-by hazards are categorized as follows:

- Struck-by flying object
- Struck-by falling object
- Struck-by swinging object
- Struck-by rolling object

#### B. Examples

Struck-by hazards in construction cause accidents such as the following:

- A construction worker was hoisting bricks in a bucket to the top of a building. The bucket tilted, and the bricks spilled out of the bucket, striking the worker in the head. The worker suffered blunt force trauma to his head, and he died at the hospital eight days later.

## NOTES:

According to OSHA, "Struck" is defined as: injuries produced by forcible contact or impact between the injured person and an object or piece of equipment.

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- Four workers were installing signs on a highway, when a pick-up truck changed several lanes and entered the work area. The truck struck one of the workers, knocking him off the road and over a bridge rail. He fell approximately 18 ft and died.
- Four workers were struck by an exterior wall while attempting to lift it in place. Three of the workers received bruises and contusions. One of the workers received a fractured leg and was hospitalized.
- A construction inspector was crossing an equipment vehicle route at an interstate highway bridge construction site. He walked into the path of the end loader traveling the route, was run over, and killed. The loader operator was unaware that he struck the inspector.
- Worker was struck by the counterweight and revolving superstructure of an excavator when he walked between the excavator and a hillside.
- Workers were pulling 60 foot sections of pipe out of a hole, using a hoist to stack them on the derrick floor. One of the workers let go of a pipe section before it was secured. As he bent over, the pipe swung around and struck him on the head, killing him.
- A worker was maneuvering an overhead crane when a metal plate weighing approximately 7,330 lbs. separated from the lifting clamp and fell, striking and killing the worker.

### C. Statistics

Occupational fatalities caused by struck-by hazards are a serious concern. According to the Bureau of Labor Statistics (BLS) report titled "Manner in which fatal work injuries occurred, 2009" preliminary data, the category of "Contact with objects and equipment is 17% of the total 4,340 fatal work injuries. Of that 17% the sub-category of "Struck-by object" was 10% [more than half].

### NOTES:

Provide examples of accidents related to the type of work your audience does. Locate accident summaries on OSHA's website.

Go to:

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

Within the keyword field, enter a keyword to be searched against. For example, to obtain accident investigations involving struck-by, enter the keyword "struck". To view a list of keywords, use the keyword list at the bottom of the Accident Investigation Search page.

You can also check OSHA's "Weekly Fatality Reports" at: [http://www.osha.gov/dep/gatcat/dep\\_fatcat.html](http://www.osha.gov/dep/gatcat/dep_fatcat.html)

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In the table below, the 2008 numbers are shown for “Crane-Related Deaths” which shows that when working with cranes, the struck-by death and injury count represents 28% of the total.

### Causes of Construction Worker Crane-Related Deaths & Injuries, Jan. 1–Dec. 31, 2008\*

Cause	# Incidents (%)	Deaths	Injuries
Crane collapses	34 (39%)	25	59
Overhead power line contacts	12 (14%)	10	8
Struck by crane load	12 (14%)	6	10
Struck by other crane parts	10 (11%)	6	7
Other causes*	20 (23%)	7	16
<b>Total</b>	<b>88</b>	<b>54</b>	<b>100</b>

\* Includes 7 highway incidents, 6 falls, 3 caught in/between, 3 struck by non-crane falling objects, and 1 struck by lightning incident

### Topic 1 Review Exercise

Ask the class to respond to the following question:  
What are the four categories of struck-by hazards mentioned?

#### NOTES:

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

Source: Michael McCann of CPWR - The Center for Construction Research and Training based on BLS data, as presented at 2010 Crane & Rigging Conference May 27, 2010

Answer:

- Struck by flying object
- Struck –by falling object
- Struck-by swinging object
- Struck-by rolling object

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## Topic 2. What are the common types of struck-by hazards in construction?

- A. Struck-by flying object
- B. Struck-by falling object
- C. Struck-by swinging object
- D. Struck-by rolling object

### Content for Topic 2

#### A. Struck-by flying object

##### Major Hazards:

Flying object hazard exists when something has been thrown, hurled, or is being propelled across space. It can include instances when a piece of material separates from a tool, machine or other equipment, striking a worker, resulting in injuries or fatality.

Also a hazard exists if an object is ejected under power by a tool or equipment usually designed for that purpose such as, a nail from a nail gun: The nail is propelled from the gun by force, it is discharged. This force can be either pneumatic or powder-actuated. Powder-actuated tools are particularly hazardous due to the force behind the fastener. These fasteners are designed to go through wood, concrete and steel and they can certainly go through worker.

Using compressed air can also cause flying object hazards. Compressed air is commonly used to power tools and clean surfaces.

##### Examples of accidents related to struck-by flying object hazards are:

- Worker was removing a frozen bolt from the track of a caterpillar front end loader and was struck-by a bolt that entered his forehead.
- Worker was freeing a pump component under pressure and was impaled by the pump component.

## NOTES:

Refer to "Hazard Alert: Nail Guns" handout [Appendix D]

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- A worker was killed when a blast of compressed air from a gas pipeline struck him. A compressor was started to fill the pipeline with compressed air in an effort to push out a "pig." when the pipeline suddenly cleared, the employee was still in the way and was killed. The area should have been cleared before the compressor was started.
- The victim was in the process of using an 8-foot step ladder to gain height to nail a strap onto a residential home single story construction project. The victim used a nail gun with a 16d nail to affix the strap to the exterior wall. Using his right hand for the gun, he leaned over to the left and tried to place a nail into the strap. The nail ricocheted and hit him on the left side of his head just above the left ear. He fell to the ground and eventually passed out. Fellow workers transported him to the hospital. He died approximately two days later.



### **Classroom Exercise** **Fatal Facts Accident Summary Report 2**

**Discuss the following accident and how it could have been prevented.**

- A carpenter apprentice was killed when he was struck in the head by a nail that was fired from a powder-actuated tool. The tool operator, while attempting to anchor a plywood form in preparation for pouring a concrete wall, fired the gun causing the nail to pass through the hollow wall. The nail travelled some twenty-seven feet before striking the victim. The tool operator had never received training in the proper use of the tool, and none of the employees in the area were wearing personal protective equipment.

### **NOTES:**

Distribute student worksheet, Fatal Facts Accident Summary No. 2 [Appendix C]

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## B. Struck-by falling object

### Major Hazards:

When the source of injury is falling from an elevation to a lower level, including instances where the injured person is crushed, pinned, or caught under a falling object, **other than collapsing material or structures**, resulting from being struck by a falling object or equipment.

### Examples of accidents related to struck-by falling object:

- Worker was tearing down a transmission structure using a digger-derrick when a pole broke and struck him on the head.
- Worker was struck by a load of wall panels that fell off his truck.
- Four workers rebuilding a bridge that had washed out by floods were injured when a crane boom cable broke, and the boom fell on them.
- Worker was engaged in cutting an 8,000-lb boiler in sections with a cutting torch. The section being cut, fell off allowing the remaining section, 5000 lbs, to flip over onto its bottom and land on the worker.
- A worker was assisting a rigger who had attached a load to the block hook of a wheel mounted crane. The crane operator was positioned in the cab and waiting for the hand signal to make the lift. During this process, the jib of the crane fell from its stowed position on the boom and struck the worker. The worker died later at the scene. It was discovered that the pin used to secure the jib to the boom was missing thus allowing the jib to be displaced. The crane was not inspected prior to use.

### NOTES:

Refer to online resources page to review: Preventing Fatal Struck-Bys in Construction, OSHA page; Struck-Bys from Elevations, NIOSH page; Aerial Lifts OSHA Quick Card (also available in Spanish) For additional information on scaffolds, see:

- Supported Scaffold Safety Tips OSHA Quick Card
- Supported Scaffold Inspection Tips OSHA Quick Card

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## Classroom Exercise Fatal Facts Accident Summary Report 8

**Discuss the following accident and how it could have been prevented.**

- Ball and socket connectors are used to attach conductor stringing blocks to insulators on the arms of 90 foot metal towers of electrical transmission lines. Normally stainless steel cotter keys secure the ball and socket connector in place. In this case, however, black electrical tape was wrapped around the socket to keep the ball in place rather than a cotter key. The tape apparently stretched and the ball came loose, dropping the stringing block approximately 90 feet onto the head of an employee below, one of a four-man erection crew.

### **C. Struck-by swinging object**

#### **Major Hazards:**

When materials are mechanically lifted, they have the potential to swing and strike workers. As the load is lifted, the materials may swing, twist or turn. This movement can catch workers by surprise and they could be hit by the swinging load. Windy conditions are especially hazardous because the load will swing more. Depending on where the worker is standing and the force behind the load, the worker may fall to another level after being struck and sustain even greater injuries. In addition to swinging, loads can slip from their riggings and strike workers. Loads must be rigged properly to prevent slippage.

When the source of injury has been referred to objects which are not free standing, they are attached at some point or are being held by the worker. This includes instances where a hinge-like motion retracts creating swinging motion in which the worker is struck-by a slamming or swinging motion.

#### **NOTES:**

Distribute student worksheet, Fatal Facts Accident Summary No. 8 [Appendix C]

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### Examples of accidents related to struck-by swinging hazards:

- Worker was working within the swing radius of a barge-mounted crane used in dredging operations. He was hit and killed.
- Two workers were instructed by their foreman to set up on a ground slab in the southeastern corner of a building. They were to land and place reinforcing steel using a crane. A truck crane was positioned at street level, 30 ft higher in elevation than the ground slab and approximately 162 ft from the landing area. The landing area was approximately 40 ft beyond the radius limit for the crane, as specified by the manufacturer. The 24 piece bundle of 28 1/2 ft long #9 rebar that was to be picked up and loaded onto the crane's hoist line was at street elevation, 50 ft in front of the crane. The operator made the pick up and was swinging around and lowering it to his left using hand signals when the right pennant line broke at the yoke/bridle. The boom collapsed, striking one of the workers on the head and killing him.

### D. Struck-by rolling object

#### Major Hazards:

Struck-by rolling object is when an object which is rolling, moving, or sliding on the same level at which the worker is located. Includes instances in which the worker is struck or run over by a moving vehicle without being caught under it or instances in which the worker is struck-by a sliding object or equipment on the same level.

#### Examples of accidents related to struck-by rolling hazards:

- While walking along track, worker was struck by unmanned rail car at airport.
- Worker (security guard) was struck by tractor trailer and dragged, resulting in fatal injuries.

NOTES:



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- Worker suffered fatal injuries after being struck by a moving semi truck while loading/unloading freight.
- Worker was performing repair operations on an impact attenuator and was struck by a truck.
- Worker was flagging traffic and was struck by a truck.
- A four-person ground crew was working with a mobile under-hung bridge crane. The crane ran over one of the crew members, who had walked too close to the wheel of the crane. The employee died of his injuries.
- A worker was setting traffic cones at a paving project. A steel wheel roller was compressing the asphalt, and the traffic cones were being moved so that they would be in the path of the roller. The worker was injured when he was struck by an automobile. He was thrown over the hood of the car and into another lane of traffic, where he was struck by another automobile. He was dragged 141 ft by the second vehicle. He was pronounced dead at the hospital.

### Topic 2 Review Exercise

Discuss with the class “How can we protect ourselves from falling objects?”

Ask the following questions:

- What are the hazards?
- What are the results?
- What should we look for?

### NOTES:

#### Possible Answers:

*What are the hazards?*

Trees falling on equipment, loads dropping on workers, heavy equipment tipping over or falling onto workers, tools falling from elevated work stations

*What are the results?*

Broken bones, head injuries, death

*What should we look for?*

Elevated work areas, toeboards missing from scaffolds, objects not secured in overhead storage, canopies missing under scaffolding, cranes making lifts, equipment operating close to trenches, embankments, and debris piles

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## Topic 3. How can I protect myself from struck-by hazards?

- A. Heavy equipment [cranes, excavators, etc.]
- B. Motor vehicles [trucks, cars, etc.]
- C. General safe work practices
- D. Personal protective equipment (PPE)

### CONTENT for Topic 3:

#### A. Heavy equipment [cranes, excavators, etc.]

- Stay away from heavy equipment when it's operating – In fact, be alert to the location of all heavy equipment whether in use or not
- Stay clear of lifted loads and never work under a suspended load
- Beware of unbalanced loads
- Workers should confirm and receive acknowledgement from the heavy equipment operator that they are visible
- Be aware of the swing radius of cranes and backhoes and do not enter that zone
- Drive equipment [or vehicles] on grades or roadways that are safely constructed and maintained
- Make sure that all workers and other personnel are in the clear before using dumping or lifting devices
- Lower or block bulldozer and scraper blades, end-loader buckets, dump bodies, etc., when not in use, and leave all controls in neutral position.
- Haulage vehicles that are loaded by cranes, power shovels, loaders etc., must have a cab shield or canopy that protects the driver from falling materials
- Do not exceed a vehicle's rated load or lift capacity
- Do not carry personnel unless there is a safe place to ride

## NOTES:

Distribute Focus 4 "Cranes and Rigging" Construction Safety Council handout [Appendix D]

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## Classroom Exercise Fatal Facts Accident Summary Report 4

**Discuss the following accident and how it could have been prevented.**

- A crew of ironworkers and a crane operator were unloading a 20-ton steel slab from a low-boy trailer using a 50-ton crawler crane with 90-foot lattice boom. The operator was inexperienced on this crane and did not know the length of the boom. Further, no one had determined the load radius. During lifting, the load moved forward and to the right, placing a twisting force on the boom. The boom twisted under the load, swinging down, under and to the right. Two employees standing 30 feet away apparently saw the boom begin to swing and ran. The boom struck one of the employees - an ironworker - on the head, causing instant death. Wire rope struck the other [a management trainee] causing internal injuries. He died two hours later at the hospital.

### NOTES:

Distribute student worksheet, Fatal Facts Accident Summary No. 4 [Appendix C]

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## B. Motor vehicles [trucks, cars, etc.]

Vehicle safety practices must be observed at construction sites to limit worker exposure to struck-by hazards such as struck-by swinging backhoes, struck-by falling/overturning vehicles, and struck-by trucks or cars.

To avoid these types of hazards, workers should:

- Wear seat belts when provided
- Check vehicles before each shift to assure that all parts and accessories are in safe operating condition
- Do not drive a vehicle in reverse gear with an obstructed rear view, unless it has an audible reverse alarm, or another worker signals that it is safe
- Set parking brakes when vehicles and equipment are parked, and chock the wheels if they are on an incline
- All vehicles must have adequate braking systems and other safety devices
- Use traffic signs, barricades or flaggers when construction takes place near public roadways
- Workers must be highly visible in all levels of light. Warning clothing, such as red or orange vests, are required; and if worn for night work, must be of reflective material

When working on or near any construction zone:

- Wear high-visibility reflective clothing
- Do not put yourself at risk of being struck by a vehicle and do not get caught in a situation where there's no escape route
- Do not direct traffic unless you are the flagger<sup>1</sup>
- Check that necessary warning signs are posted
- Never cross the path of a backing vehicle<sup>2</sup>
- Follow "Exit" and "Entry" worksite traffic plan

## NOTES:

For additional information:

29 CFR 1926 Subpart G, Signs, signals, and barricades.

1926.201, Signaling

29 CFR 1926 Subpart O, Motor vehicles, mechanized equipment, and marine operations.

1926.601, Motor Vehicles [29 CFR 1926.601(b)(9)],

<sup>1</sup>Flaggers and other workers on foot are at greater risk of exposure to being struck; therefore, they must be visible by both motorists and equipment operators.

<sup>2</sup>If the equipment doesn't have reverse signal alarm loud enough to be heard against the surrounding noise level, the employer will designate a worker to signal when it's safe to back up when the operator has an obstructed view to the rear.

## Construction Focus Four: Struck-By Hazards

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### C. General safe work practices

- **When working with compressed air:** ▶ Reduce air pressure to 30 psi if used for cleaning, and use only with appropriate guarding and proper protective equipment; and ▶ Never clean clothing with compressed air
- **When working with hand tools:** ▶ Do not use tools with loose, cracked or splintered handles; and ▶ Do not use impact tools with mushroomed heads
- **When working with machines, such as jack hammers, pavement saws:** ▶ Be sure to be trained on safe operation of machinery. Inspect machinery; ▶ Ensure all guards are in place and in working order; and ▶ Protect feet, eyes, ears and hands; wear hearing protection
- **When performing overhead work:** ▶ Secure all tools and materials; ▶ Use toeboards, screens, guardrails and debris nets. Barricade the area and post signs; and ▶ Be sure materials stored in buildings under construction are placed farther than 6 feet of hoist way / floor openings, and more than 10 feet from an exterior wall
- **When working with powder-actuated tools:** ▶ Be sure to be trained and licensed to operate these tools if required
- **When working with power tools, such as saws, drills, grinders:** ▶ Be sure to be trained on how to safely use the power tool. Inspect tool(s) before each use; ▶ Wear safety goggles; ▶ Operate according to manufacturer's instructions; and ▶ Ensure that all required guards are in place
- **When pushing or pulling objects that may become airborne:** ▶ Stack and secure materials to prevent sliding, falling or collapse; ▶ Keep work areas clear; and ▶ Secure material against wind gusts

NOTES:

# Construction Focus Four: Struck-By Hazards



## Classroom Exercise Tool Box Talks 3

**Discuss the following accident and how it could have been prevented.**

A worker was cutting a 6-inch steel water pipe with a gas-powered abrasive wheel when the saw kicked back and struck the worker's face shield, resulting in a laceration and two fractures to the nose.

### **D. Personal protective equipment (PPE)**

Eye and face protection:

- Use based on anticipated hazards
- Safety glasses or goggles should be worn any time work operations present an eye hazard – for example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles)

Head protection

- Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects
- Hard hats: Routinely inspect for dents, cracks or deterioration; replace after a heavy blow; maintain in good condition

### **NOTES:**

Distribute worksheets for Tool Box Talks 3 [Appendix B].

Distribute Focus 4 "Personal Protective Equipment" handout [Appendix D]

Face shields are intended to protect the entire face or portions of it from impact hazards such as flying fragments, objects, large chips, and particles. When worn alone, face shields *do not* protect employees from impact hazards. Workers should use face shields in combination with safety spectacles or goggles, even in the absence of dust or potential splashes, for additional protection beyond that offered by spectacles or goggles alone.

# Construction Focus Four: Struck-By Hazards

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## Topic 3 Review Exercise

Discuss with the class:

1. How can we work safely around heavy equipment?"

- What are the hazards?
- What are the results?
- What should we look for?

2. How do we prevent struck-by incidents involving power tools?

- What are the hazards?
- What are the results?
- What should we look for?

## NOTES:

### 1. Possible Answers:

#### ***What are the hazards?***

Heavy equipment backing over workers, cranes hitting workers during swings, equipment dropping loads onto workers, workers not visible at night.

#### ***What are the results?***

Broken bones, head injuries, death

#### ***What should we look for?***

Heavy equipment traffic, poor visibility, working backup alarms, cranes with swing radius clearly marked, spotters during backing up.

### 2. Possible Answers:

#### ***What are the hazards?***

Powder-actuated fasteners penetrating walls, pneumatic hoses whipping and missing safety devices at the source, grinding wheels shattering, circular saws.

#### ***What are the results?***

Eye injuries including blindness, face lacerations, head injuries, death

#### ***What should we look for?***

Defective tools and cords, missing guards, powder-actuated tools being used near other trades.

# Construction Focus Four: Struck-By Hazards

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## Topic 4. What is my employer required to do to protect workers from struck-by hazards?

- A. Heavy equipment [cranes, excavators, etc.]
- B. Motor vehicles [trucks, cars, etc.]
- C. General requirements for protecting workers
- D. Provide personal protective equipment (PPE)
- E. Training

### Content for Topic 4:

#### A. Heavy equipment [cranes, excavators, etc.]

Employers must:

- Determine whether the ground is sufficiently level and firm to support the anticipated weight of hoisting equipment and associated loads
- Assess hazards within the work zone that would affect the safe operation of hoisting equipment such as, power lines and objects or personnel that would be within the swing radius of the hoisting equipment
- Erect barriers to mark the area covered by the rotating superstructure to warn workers of the danger zone
- Ensure that the equipment is in safe operating condition via required inspections
- Comply with all manufacturer procedures regarding proper operational functions of equipment, including its use with attachments
- Ensure safe attachment of rigging devices such as, shackles, hooks, eyebolts, spreader beams and slings, wedge socket and wire rope clips
- Provide seat belts when required
- Ensure roadways and grades are maintained to accommodate the safe movement of equipment and vehicles
- Ensure all earthmoving/compacting equipment with obstructed view does not operate in reverse gear unless the equipment has a reverse signal alarm or a worker has been designated to signal when it is safe

#### NOTES:

This section highlights selected requirements only and is not a comprehensive coverage of OSHA construction standards that have requirements to reduce the occurrence of struck-by hazards.

Refer to 29 CFR 1926 Subpart CC – Cranes and Derricks in Construction

Sections 1926.1402, Ground conditions; 1926.1424 Work area control

If a worker must enter a marked area, the crane operator must be notified of the entry, and must not rotate the superstructure until the area is clear

See 1926.602 Material handling equipment; 1926.601 Motor vehicles; 1926.604 Site clearing; 1926.603 Pile driving equipment 1926.651 Specific excavation requirements

Subpart W – Rollover Protective Structures; Overhead Protection



# Construction Focus Four: Struck-By Hazards

## B. Motor vehicles [trucks, cars, etc.]

The employer is required to do the following:

- Conduct a hazard assessment of the worksite using the job-site coordinator (supervisor or foreman) who should
  - ▶ Make a thorough assessment of potential worksite safety hazards;
  - ▶ Plan for work being conducted in close proximity of a public road or highway and for the safe handling of intermittent roadway traffic stoppages, such as a truck entering a roadway;
  - and ▶ Plan the entry and exit to and from the worksite to reduce exposure to traffic
- Post construction areas with legible traffic signs at points of hazard
- Erect barricades that conform to the MUTCD
- Place necessary warning signs along the road
- All workers on site should have a safety and operations orientation

## C. General requirements for protecting workers

Employers must ensure:

- All hand tools are maintained in good condition
- The use of unsafe hand tools is not permitted (i.e., no sprung jaws on wrenches, no mushroomed heads, no splinters or cracks in wooden handles, no loose parts / heads of tools)
- Saws are equipped with guards and have a constant pressure switch that will shut off the power when the pressure is released
- Safety guards are on all abrasive wheel bench and stand grinders
- Only trained workers are allowed to operate powder-actuated tools
- All powder-actuated tools are tested daily before use and all defects discovered before or during use are corrected
- Powder-actuated tools are not loaded until immediately before use and loaded tools are not left unattended

## NOTES:

See OSHA 29 CFR 1926 Subpart G – Signs, Signals, and Barricades

Depending on the work being done, warning signs such as ROAD WORK AHEAD, SHOULDER WORK, or ROAD MACHINERY AHEAD should be used. If a flagger will be used, a FLAGGER AHEAD sign should also be used.

Online resource: Manual on Uniform Traffic Control Devices (MUTCD) at:  
<http://mutcd.fhwa.dot.gov>

1926.451(h) Falling object protection

Subpart H – Materials Handling, Storage, Use, and Disposal  
Subpart I – Tools – Hand and Power  
Subpart E – Personal Protective and Life Saving Equipment  
Subpart T – Demolition

## Construction Focus Four: Struck-By Hazards

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- Compressed air used for cleaning purposes is reduced to less than 30 pounds per square inch (psi) and provide effective chip guarding and PPE
- All materials stored in tiers are secured to prevent sliding, falling, or collapsing
- Toeboards are erected along the edge of overhead walking/working surfaces

### **D. Provide personal protective equipment (PPE)**

Employers must:

- Pay for PPE as required by OSHA
- Provide and require the use of appropriate PPE in all operations where there is an exposure to hazardous conditions
- Ensure adequacy of PPE including proper maintenance and sanitation
- Provide head protection (e.g., hard hats, helmets) whenever there is possible danger of head injuries from impact, flying or falling objects
- Provide eye and face protection when machines or operations present eye or face injury
- Provide workers involved in welding operations with filter lenses or plates of proper shade number
- Ensure eye, face and head protective equipment meets ANSI requirements

### **E. Training**

- Train workers in the work zone to recognize hazards associated with the use of the equipment and any related duties that they are assigned to perform
- Ensure crane operators are qualified or certified according to OSHA standards
- Ensure signal person meets qualification requirement according to OSHA standards

### **NOTES:**

Refer to “Employers Must Provide and Pay for PPE” – Handout #7 from Intro to OSHA session

For further information regarding operator, signaler and rigger qualification and certification requirements, see OSHA 29 CFR 1926 Subpart CC Section 1926.1428 Signal person qualifications, 1926.1430 – Training requirements, 1926.21(b)(2)

OSHA Cranes and Derricks in Construction Final Rule, Compliance Assistance Fact Sheets <http://www.osha.gov/cranes-derricks/index.html> Fact Sheets

# Construction Focus Four: Struck-By Hazards

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- Instruct workers in the recognition and avoidance of unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury
- Ensure that qualified operators and riggers have been trained on rigging safety

## Topic 4 Review Exercise



### Classroom Exercise

### Fatal Facts Accident Summary Report 4

**Discuss the following accident and how it could have been prevented.**

- Employees were dismantling grain spouts at a grain elevator. Sections of the spout were connected by collars. A ten foot section of a spout weighing 600 pounds was being pulled through a vent hole by a 5-ton winch. As the spout was being pulled through the opening to the outside, the spout became wedged at the point where the collar was to pass through. Several employees used pry bars to free the collar which was under tension. The spout popped out of the vent striking and killing an employee who was standing beside the spout. Employer provided but did not require use of hard hats.

### NOTES:

The basic Rules of Rigging all qualified operators and riggers must know is to:

- Know the weight [of load] the rigging is expected to support
- Know the capacity of the strength of the rigging (type and method of use)
- Retain the load – know which hitches work best for certain types of loads
- Control the load – know which hitches provide good load control and where the center of gravity of the load is

Source: Construction Safety Council

Distribute student worksheet, Fatal Facts Accident Summary No. 51 [Appendix C]

# Construction Focus Four: Struck-By Hazards

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## Summary

During this lesson, workers have been given an overview of common struck-by hazards, ways to protect themselves, and what employers must do to protect workers from struck-by 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: Struck-By Hazards

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## References/Sources

- Bureau of Labor Statistics (BLS) website <http://www.bls.gov>
- Centers for Disease Control and Prevention (CDC)/The National Institute for Occupational Safety and Health (NIOSH) website <http://www.cdc.gov/niosh>
- Construction Hazard Awareness, by the University of Alabama Continuing Studies Environmental and Industrial Programs website <http://alabamasafestate.ua.edu>
- Construction Safety Council website <http://www.buildsafe.org>
- Electronic Library of Construction Occupational Safety and Health (eLCOSH), by The Center for Construction Research and Training [CPWR], with funding by NIOSH website <http://www.cpwr.com/rp-elcosh.html>
- Eye and Face Protection eTool. <http://www.osha.gov>
- McCann, Michael of CPWR - The Center for Construction Research and Training based on BLS data, as presented at 2010 Crane and Rigging Conference May 27, 2010
- Occupational Safety and Health Administration (OSHA) website <http://www.osha.gov>
- Susan Harwood Grant from OSHA materials:
  - Number SH-16591-07-06-F-11 – International Union of Operating Engineers National Training Fund Focus Four
  - Number SH-16586-07-06-F-36 – National Council for Occupational Safety and Health, Chapel Hill, NC, Construction Safety and Health “Struck-by” Hazards Grantee module
  - Number SH-17792-08-60-F-48 – Compacion Foundation
- The Construction Chart Book (CPWR, 2007) available online at <http://www.cpwr.com/rp-chartbook.html>

## Construction Focus Four: Struck-By Hazards

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## APPENDIX A

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### **Appendix A: Struck-By Hazards Lesson Test**

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

*Student copy to distribute follows*

## APPENDIX A

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## Construction Focus Four: Struck-By Hazards Lesson Test

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

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

1. Struck-by injuries are produced by forcible contact or impact between the injured person and a/n \_\_\_\_\_.
  - a. High voltage power line or other energy source
  - b. Object or piece of equipment
  - c. Co-worker or employer
  
2. The following are examples of struck-by hazards. Which one is an example of a struck-by flying hazard?
  - a. Hit by a nail from a nail gun
  - b. Hit by a load dropped from a crane
  - c. Run over by a vehicle in a roadway work zone
  
3. As a load is mechanically lifted, the materials \_\_\_\_\_.
  - a. May strike workers if the load swings, twists or turns
  - b. Will not be affected by windy conditions or bad weather
  - c. Can weigh any amount without causing a problem with the equipment
  
4. Among the list of ways workers can protect themselves when working on or near any construction zone, is to \_\_\_\_\_.
  - a. Direct traffic in and out of the work zone
  - b. Work behind moving vehicles
  - c. Wear high-visibility reflective clothing
  
5. A struck-by hazard can be described as anytime a worker \_\_\_\_\_.
  - a. Falls from a height of greater than ten feet
  - b. Is hit by a falling, swinging, flying or rolling object
  - c. Can get any part of his/her body caught in or in between objects
  
6. Employers must protect workers from struck-by hazards by \_\_\_\_\_.
  - a. Providing PPE such as hard hats and safety glasses
  - b. Establishing guidelines that allow only contractors access in the crane work zone
  - c. Ensuring guards on tools and equipment are removed when it is absolutely necessary to get the job done



## APPENDIX B

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### Appendix B: Focus Four Toolbox Talks

Contents:

- Focus Four Toolbox Talks 1 and 2 are Activity Options A and B [Instructor and Student copies]
- Focus Four Toolbox Talks 3

## APPENDIX B

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## APPENDIX B

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### OPTION A: Focus Four Toolbox Talks 1 [Instructor copy]

#### **Actual Incident:**

A 36-year-old construction inspector for the county died when an asphalt dump truck backed over him. The inspector was wearing an orange reflective vest and hard-hat and the dump truck had a backup alarm that was functioning. The truck traveled approximately 770 feet in reverse.

#### Ask the following question.

#### How do we prevent these results?

- Never work directly under a suspended load.
- Watch for signs of problems during each lift.
- Always check for overhead power lines and other obstructions.
- Have a spotter during backing up and stay out of blind spots.
- Make sure there is a written plan for critical lifts.
- Wear high-visibility clothing.
- Make sure backup alarms are working and listen for them.
- Communicate with operators by radio and by eye contact.

#### Ask the following questions for discussion.

#### Let's talk about some site conditions:

- Are there any areas with particularly blind spots for operators [i.e., backing up]?
- Are there hazards that could exist that we all should be aware of?
- Is there something we can do to limit the risks from these hazards?

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## APPENDIX B

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## OPTION A: Focus Four Toolbox Talks 1 [Student copy]

### Actual Incident:

A 36-year-old construction inspector for the county died when an asphalt dump truck backed over him. The inspector was wearing an orange reflective vest and hard-hat and the dump truck had a backup alarm that was functioning. The truck traveled approximately 770 feet in reverse.

How do we prevent these results?

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Additional discussion notes:

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## APPENDIX B

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### OPTION B: Focus Four Toolbox Talks 2 [Instructor copy]

#### **Actual Incident:**

A 56-year-old truck driver was crushed when a crane tipped over and the crane's boom landed on the cab of the dump truck in which he was sitting. The crane had been lowering an empty 4-yard concrete bucket, while booming out.

#### **Ask the following question.**

#### **How do we prevent these results?**

- Operators must know the capacity of their equipment and work from a load chart.
- Workers on the ground should always keep an eye on nearby operations and never assume the operation is completely safe.
- Operators must be particularly careful where trees are being cleared and stay far enough away to avoid being struck.
- Everyone on the site needs to wear their hard hats all the time.
- Everyone should stay away from ongoing operations unless they are needed for the work.

#### **Ask the following questions for discussion.**

#### **Let's talk about some site conditions:**

- What is the greatest potential for being struck by falling materials on this site?
- Is there something we can do to limit the risks from these hazards?
- Are there any particularly steep embankments that could pose a rollover risk?

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## APPENDIX B

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## APPENDIX B

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### Focus Four Toolbox Talks 3 [Instructor copy]

#### **Actual Incident:**

A worker was cutting a 6-inch steel water pipe with a gas-powered abrasive wheel when the saw kicked back and struck the worker's face shield, resulting in a laceration and two fractures to the nose.

[Ask the following question.](#)

#### **How do we prevent these results?**

- Wear safety glasses and face shields when working with these tools.
- Make sure workers using powder-actuated tools have been trained. If not, they are a risk to everyone working nearby.
- Never place hand or fingers over the front muzzle end of a powder-actuated tool and always hold the tool perpendicular to the work, insuring the spall guard is in place.
- Inspect tools to insure that protective guards are in place and in good condition.
- Perform ring tests of grinding wheels to determine if they are intact.
- Keep the cord behind the cut to prevent cutting the cord.
- Never stand in line with the unprotected part of a grinding wheel, stand to the side and out of the plane of rotation during start-up. Always wear safety glasses and full-face shields.
- Check electric tools for defects, such as missing grounding pins and cracked cases, before using and always use a GFCI.

[Ask the following questions for discussion.](#)

#### **Let's talk about some site conditions:**

- Has anyone seen powder-actuated tools being used on this site? Why are we concerned about these tools? Who is most at risk from these tools?
- Why is it so important to inspect electric power tools before each use?
- Why do we need to use GFCIs with all electric tools? What do they do?

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## APPENDIX B

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## Focus Four Toolbox Talks 3 [Student copy]

### Actual Incident:

A worker was cutting a 6-inch steel water pipe with a gas-powered abrasive wheel when the saw kicked back and struck the worker's face shield, resulting in a laceration and two fractures to the nose.

How do we prevent these results?

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Additional discussion notes:

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## APPENDIX C

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### Appendix C: Fatal Facts Accident Summary Reports

Contents:

- Fatal Facts Accident Report #2
- Fatal Facts Accident Report #4
- Fatal Facts Accident Report #8
- Fatal Facts Accident Report #51

## APPENDIX C

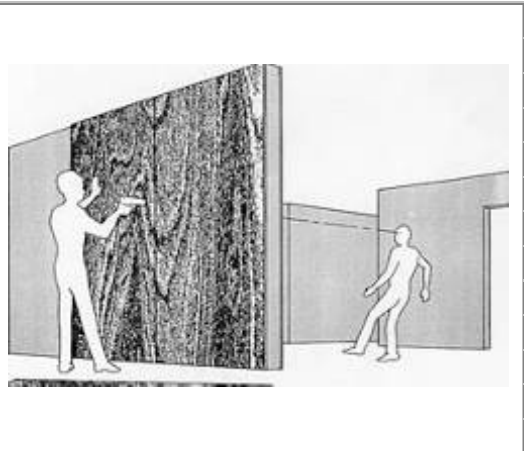
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## APPENDIX C

# ACCIDENT REPORT FATAL FACTS

### ACCIDENT SUMMARY No. 2

Accident Type:	Struck by Nail
Weather Conditions:	N/A
Type of Company:	General Contractors
Size of Work Crew:	17
Union or Non-union:	Union
Worksite Inspection?:	No
Designated Competent Person on Site?:	No
Employer Safety and Health Program?:	No
Training and Education for Employees?:	No
Craft of Deceased Employee(s):	Carpenter
Age; Sex	22; Male
Time of the Job:	3:00 p.m.
Time at the Task	Unknown



### BRIEF DESCRIPTION OF ACCIDENT

A carpenter apprentice was killed when he was struck in the head by a nail that was fired from a powder actuated tool. The tool operator, while attempting to anchor a plywood form in preparation for pouring a concrete wall, fired the gun causing the nail to pass through the hollow wall. The nail travelled some twenty-seven feet before striking the victim. The tool operator had never received training in the proper use of the tool, and none of the employees in the area were wearing personal protective equipment.

### INSPECTION RESULTS

Section not listed on original

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Institute a program for frequent and regular inspections of the job site, materials, and equipment by a competent person(s) (1926.20(b)(2)).
2. Require employees exposed to the potential hazards associated with flying nails to use appropriate personal protective equipment. (1926.100(a) and 1926.102(a)(1)).
3. Train employees using powder actuated tools in the safe operation of the particular tool (1926.302(e)(2)).
4. Train employees operating power actuated tools to avoid firing into easily penetrated materials (1926.302(e)(8)).

**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 REPORT FATAL FACTS

### ACCIDENT SUMMARY No. 4

Accident Type:	Struck by Collapsing Crane Boom	
Weather Conditions:	Clear	
Type of Company:	General Contractor	
Size of Work Crew:	9	
Union or Non-union:	Union	
Worksite Inspections Conducted:	Yes	
Designated Competent Person on Site (1926.20(b)(2)):	Yes	
Employer Safety Health Program:	Yes	
Training and Education for Employees:	Yes	
Craft of Deceased Employee(s):	1. Iron Worker 2. Management Trainee	
Age & Sex	1. Ironworker-35; male 2. Management Trainee-26; male	
Time on the Job:	1 hour	
Time on Task:	1 hour	

### BRIEF DESCRIPTION OF ACCIDENT

A crew of ironworkers and a crane operator were unloading a 20-ton steel slab from a low-boy trailer using a 50-ton crawler crane with 90-foot lattice boom. The operator was inexperienced on this crane and did not know the length of the boom. Further, no one had determined the load radius. During lifting, the load moved forward and to the right, placing a twisting force on the boom. The boom twisted under the load, swinging down, under and to the right. Two employees standing 30 feet away apparently saw the boom begin to swing and ran. The boom struck one of the employees - an ironworker - on the head, causing instant death. Wire rope struck the other -- a management trainee -- causing internal injuries. He died two hours later at a local hospital.

### INSPECTION RESULTS

Section not listed on original

### ACCIDENT PREVENTION RECOMMENDATIONS

1. Train and test operators to determine qualifications: 29 CFR 1926.21(b)(2) and 29 CFR 1926.550(b) ANSI B30.5 5-3.1.2.
2. Require proper written procedures to insure the method for lifting is within manufacturer's specifications: 29 CFR 1926.550(a)(1).

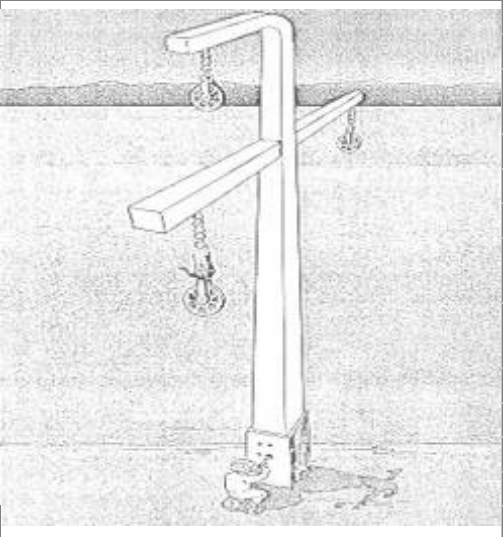
**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have been resolved, and the case is now closed.

## APPENDIX C

# ACCIDENT REPORT FATAL FACTS

### ACCIDENT SUMMARY No. 8

Accident Type:	Struck by Falling Object
Weather Conditions:	Clear
Type of Operation:	Transmission Tower Construction
Size of Work Crew:	4
Union or Non-union:	Union
Competent Safety Monitor on Site:	Yes
Safety and Health Program in Effect:	Yes
Was the Worksite Inspected Regularly:	Yes
Training and Education Provided:	No
Employee Job Title:	Groundman (Framer)
Age & Sex:	24-Male
Experience at this Type of Work:	2 Years
Time on Project:	3 Days



### BRIEF DESCRIPTION OF ACCIDENT

Ball and socket connectors are used to attach conductor stringing blocks to insulators on the arms of 90 foot metal towers of electrical transmission lines. Normally stainless steel cotter keys secure the ball and socket connector in place. In this case, however, black electrical tape was wrapped around the socket to keep the ball in place rather than a cotter key. The tape apparently stretched and the ball came loose, dropping the stringing block approximately 90 feet onto the head of an employee below, one of a four-man erection crew.

### INSPECTION RESULTS

As result of the its investigation, OSHA issued citations alleging three serious and two other-than-serious violations.

OSHA's construction safety standards include several requirements which, if they had been followed here, might have prevented this fatality.

### ACCIDENT PREVENTION RECOMMENDATIONS

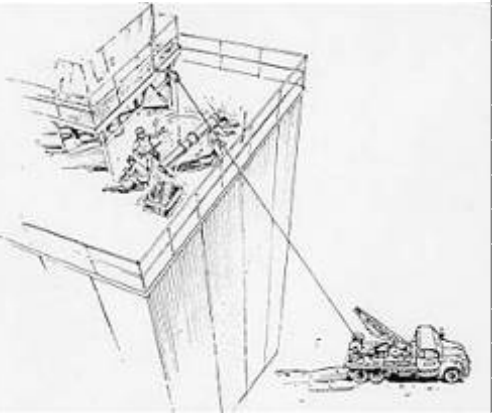
1. Rigging and equipment must be inspected regularly and maintained in safe operating condition as required by general provisions of OSHA's construction (29 CFR 1926.995).
2. Employees must be instructed to recognize and avoid unsafe conditions and be made aware of regulations which apply to the work and the work area to eliminate safety and health hazards as required in the safety training and education section of OSHA's construction safety standards (29 CFR 1926.21(b)(2)).

**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 REPORT FATAL FACTS

### ACCIDENT SUMMARY No. 51

Accident Type:	Struck By	
Weather Conditions:	Clear/Cool/Windy	
Type of Operation:	Construction Maintenance	
Size of Work Crew:	3	
Collective Bargaining:	Yes	
Competent Safety Monitor on Site:	No	
Safety and Health Program in Effect:	No	
Was the Worksite Inspected Regularly:	Inadequate*	
Training and Education Provided:	No	
Employee Job Title:	Laborer	
Age & Sex:	33-Male	
Experience at this Type of Work:	18 Weeks	
Time on Project:	1 Day	

### BRIEF DESCRIPTION OF ACCIDENT

Employees were dismantling grain spouts at a grain elevator. Sections of the spout were connected by collars. A ten foot section of a spout weighing 600 pounds was being pulled through a vent hole by a 5-ton winch. As the spout was being pulled through the opening to the outside, the spout became wedged at the point where the collar was to pass through. Several employees used pry bars to free the collar which was under tension. The spout popped out of the vent striking and killing an employee who was standing beside the spout. \* Employer provided but did not require use of hard hats.

### INSPECTION RESULTS

As a result of its investigation, OSHA issued two citations alleging serious violations. The employee should have been able to recognize that this situation was hazardous. Additionally, the investigation revealed that this employee was not wearing personal protective equipment in this hazardous situation. Had he been wearing a hard hat this death might have been prevented.

### ACCIDENT PREVENTION RECOMMENDATIONS

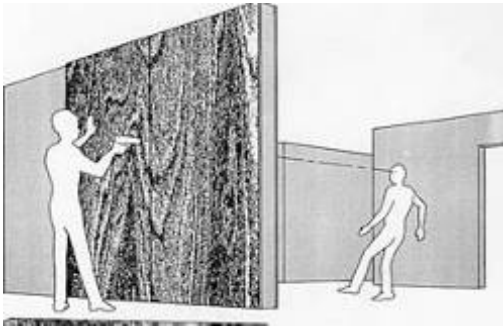
Employees must be instructed in the recognition and avoidance of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness or injury [29 CFR 1926.21(b)(2)].

**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. 2

Accident Type:	Struck by Nail	
Weather Conditions:	N/A	
Type of Company:	General Contractors	
Size of Work Crew:	17	
Union or Non-union:	Union	
Worksite Inspection?:	No	
Designated Competent Person on Site?:	No	
Employer Safety and Health Program?:	No	
Training and Education for Employees?:	No	
Craft of Deceased Employee(s):	Carpenter	
Age; Sex	22; Male	
Time of the Job:	3:00 p.m.	
Time at the Task	Unknown	

## BRIEF DESCRIPTION OF ACCIDENT

A carpenter apprentice was killed when he was struck in the head by a nail that was fired from a powder actuated tool. The tool operator, while attempting to anchor a plywood form in preparation for pouring a concrete wall, fired the gun causing the nail to pass through the hollow wall. The nail travelled some twenty-seven feet before striking the victim. The tool operator had never received training in the proper use of the tool, and none of the employees in the area were wearing personal protective equipment.

## INSPECTION RESULTS

Section not listed on original

## ACCIDENT PREVENTION RECOMMENDATIONS

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**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. 4

Accident Type:	Struck by Collapsing Crane Boom	
Weather Conditions:	Clear	
Type of Company:	General Contractor	
Size of Work Crew:	9	
Union or Non-union:	Union	
Worksite Inspections Conducted:	Yes	
Designated Competent Person on Site (1926.20(b)(2)):	Yes	
Employer Safety Health Program:	Yes	
Training and Education for Employees:	Yes	
Craft of Deceased Employee(s):	3. Iron Worker 4. Management Trainee	
Age & Sex	3. Ironworker-35; male 4. Management Trainee-26; male	
Time on the Job:	1 hour	
Time on Task:	1 hour	

## BRIEF DESCRIPTION OF ACCIDENT

A crew of ironworkers and a crane operator were unloading a 20-ton steel slab from a low-boy trailer using a 50-ton crawler crane with 90-foot lattice boom. The operator was inexperienced on this crane and did not know the length of the boom. Further, no one had determined the load radius. During lifting, the load moved forward and to the right, placing a twisting force on the boom. The boom twisted under the load, swinging down, under and to the right. Two employees standing 30 feet away apparently saw the boom begin to swing and ran. The boom struck one of the employees - an ironworker - on the head, causing instant death. Wire rope struck the other -- a management trainee -- causing internal injuries. He died two hours later at a local hospital.

## INSPECTION RESULTS

Section not listed on original

## ACCIDENT PREVENTION RECOMMENDATIONS

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**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. 8

Accident Type:	Struck by Falling Object	
Weather Conditions:	Clear	
Type of Operation:	Transmission Tower Construction	
Size of Work Crew:	4	
Union or Non-union	Union	
Competent Safety Monitor on Site:	Yes	
Safety and Health Program in Effect:	Yes	
Was the Worksite Inspected Regularly:	Yes	
Training and Education Provided:	No	
Employee Job Title:	Groundman (Framer)	
Age & Sex:	24-Male	
Experience at this Type of Work:	2 Years	
Time on Project:	3 Days	

## BRIEF DESCRIPTION OF ACCIDENT

Ball and socket connectors are used to attach conductor stringing blocks to insulators on the arms of 90 foot metal towers of electrical transmission lines. Normally stainless steel cotter keys secure the ball and socket connector in place. In this case, however, black electrical tape was wrapped around the socket to keep the ball in place rather than a cotter key. The tape apparently stretched and the ball came loose, dropping the stringing block approximately 90 feet onto the head of an employee below, one of a four-man erection crew.

## INSPECTION RESULTS

As result of the its investigation, OSHA issued citations alleging three serious and two other-than-serious violations.

OSHA's construction safety standards include several requirements which, if they had been followed here, might have prevented this fatality.

## ACCIDENT PREVENTION RECOMMENDATIONS

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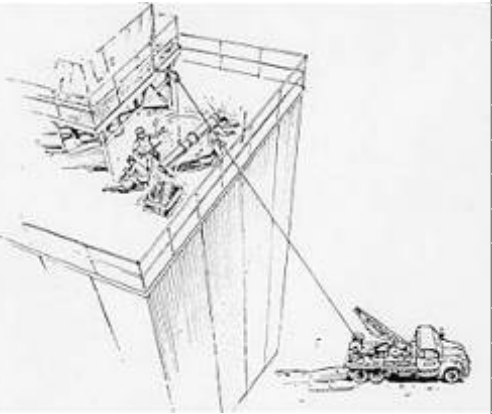


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**NOTE:** The case here described was selected as being representative of fatalities caused by improper work practices. No special emphasis or priority is implied nor is the case necessarily a recent occurrence. The legal aspects of the incident have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

# ACCIDENT REPORT FATAL FACTS

## ACCIDENT SUMMARY No. 51

Accident Type:	Struck By	
Weather Conditions:	Clear/Cool/Windy	
Type of Operation:	Construction Maintenance	
Size of Work Crew:	3	
Collective Bargaining	Yes	
Competent Safety Monitor on Site:	No	
Safety and Health Program in Effect:	No	
Was the Worksite Inspected Regularly:	Inadequate*	
Training and Education Provided:	No	
Employee Job Title:	Laborer	
Age & Sex:	33-Male	
Experience at this Type of Work:	18 Weeks	
Time on Project:	1 Day	

### BRIEF DESCRIPTION OF ACCIDENT

Employees were dismantling grain spouts at a grain elevator. Sections of the spout were connected by collars. A ten foot section of a spout weighing 600 pounds was being pulled through a vent hole by a 5-ton winch. As the spout was being pulled through the opening to the outside, the spout became wedged at the point where the collar was to pass through. Several employees used pry bars to free the collar which was under tension. The spout popped out of the vent striking and killing an employee who was standing beside the spout. \* Employer provided but did not require use of hard hats.

### INSPECTION RESULTS

As a result of its investigation, OSHA issued two citations alleging serious violations. The employee should have been able to recognize that this situation was hazardous. Additionally, the investigation revealed that this employee was not wearing personal protective equipment in this hazardous situation. Had he been wearing a hard hat this death might have been prevented.

### ACCIDENT PREVENTION RECOMMENDATIONS

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**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 D

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### Appendix D: Student Handouts

Contents:

- Hazard Alert – Nail Gun Safety
- Focus 4 “Cranes and Rigging”
- PPE for Workers Checklist

## APPENDIX D

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## How to prevent injury

- ◆ Ask for a nail gun with a sequential trigger mechanism.
- ◆ **NEVER** shoot towards yourself or a co-worker.
- ◆ Do not press the trigger unless the nose of the gun (contact element) is firmly pressed against the work material.
- ◆ **NEVER** walk around with your finger on the trigger.
- ◆ **NEVER** clean or clear jams or adjust a nail gun when it is connected to the air supply.
- ◆ Avoid nailing into knots and metal; nails are more likely to ricochet. Dense materials, like laminated beams, are also difficult to nail.
- ◆ **NEVER** remove or bypass safety devices, triggers, or contact springs.
- ◆ **NEVER** use a defective tool. If a tool is malfunctioning, it needs to be tagged and taken out of service.

To read stories about nail gun injuries and see photos, visit  
[www.cpwr.com/nailguns](http://www.cpwr.com/nailguns)

To learn more about CPWR, visit  
[www.cpwr.com](http://www.cpwr.com)

For more safety and health information, visit  
[www.elcosh.org](http://www.elcosh.org)



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# HAZARD ALERT

## Nail Guns



Serious – even fatal – injuries are happening to workers using these tools.

## What's the problem?

Nail guns are popular for a reason. They get the job done in a blink of an eye.

But that rapid-fire action can work against you. In a split second, a nail can enter your finger, your hand, or worse.

Nail gun injuries are much more common than people think. Most injuries involve puncture wounds to hands or fingers, but serious, even fatal, injuries are also associated with the use of these tools.

## How most nail gun injuries happen

- ◆ Accidental or unintended firing, often associated with recoil of the tool after firing
- ◆ Ricocheting nails
- ◆ Nail going through work surface
- ◆ Airborne nails
- ◆ By-passed safety features
- ◆ Unsafe work practices
- ◆ Holding finger on contact trigger



## Basic information about nail guns

Although there are many types of nail guns (framing, finishing, flooring, etc.), there are two common triggers:

**Contact trip trigger** mechanisms allow the tool to fire anytime the trigger and the nose of the gun (contact element) are both depressed. Trigger can be held down to allow bump or bounce nailing.

**Sequential triggers** require the nose of gun (contact element) to be depressed before the trigger is pulled. That avoids inadvertent discharge of nails.

### WARNING:

The two triggers look exactly alike. You will not be able to tell the difference!

If you can "bump nail" by holding the trigger down, and bouncing the nose against a nailing surface, that is a contact trigger gun.

**Use extreme caution.**



## Why it's important:

- 1) The **contact trip trigger mechanism carries twice the risk** of the sequential trigger, even after considering experience and training.
- 2) Accidental firings are most common following recoil of tools with contact trip triggers.
- 3) If **you are not trained** in using either of these tools, you are at high risk of injury.



## "Faster" trigger does not increase productivity

A recent study measuring productivity in construction found that the contact trip trigger showed no significant difference (less than 1 percent) in productivity than the sequential trigger. Also, there was no significant difference between the two tools in nail count and placement.

The study, which involved journeymen carpenters with an average of 13 years in the trade, found that **the difference in productivity was the worker, not the tool.**

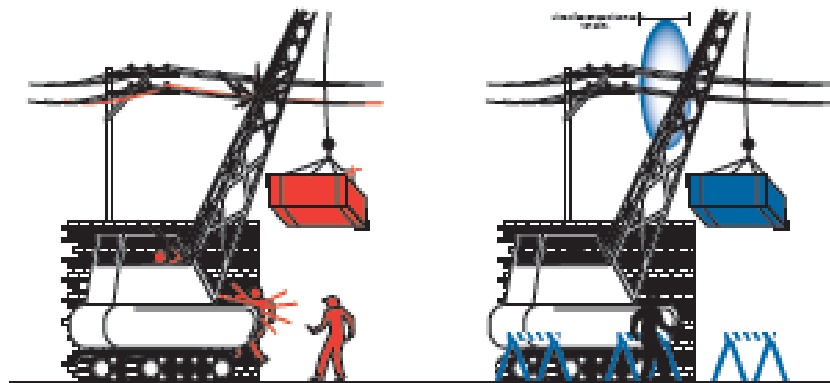
# FOCUS

## Cranes and rigging

Properly securing any load with appropriate rigging is crucial to any lifting being done by machinery on the job-site. If the rigging fails the results can cause serious injury and even death. Before any load is lifted all components of the rigging hardware should be evaluated to ensure they can withstand the forces of the load.

Follow these safe work practices

1. Guard all exposed gears, rotating shafts, pulleys, sprockets or other moving parts to prevent contact with employees.
2. Guard or block the swing radius of the crane to restrict and prevent employees from entering into and being struck by the machine.
3. Inspect all rigging equipment prior to each lift, this should include all slings, chains, ropes, and like materials used to support and lift materials.
4. Remove from service any defective equipment immediately.
5. Be sure to inspect all hooks, clamps, and other lifting accessories for their rated load.
6. Clearly communicate to all employees on site that no one is permitted to work under loads.
7. Be sure the person responsible for signaling the crane operator stays in visual contact with the operator and has been trained to use the correct signals.



WRONG WAY

RIGHT WAY

**CONSTRUCTION**  
SAFETY COUNCIL

[www.buildsafe.org](http://www.buildsafe.org)

16 — English





## PPE for Workers Checklist

Protection	TYPICAL OPERATIONS OF CONCERN	YES	NO
<b>EYE</b> 	Sawing, cutting, drilling, sanding, grinding, hammering, chopping, abrasive blasting, punch press operations, etc.		
	Pouring, mixing, painting, cleaning, siphoning, dip tank operations, dental and health care services, etc.		
	Battery charging, installing fiberglass insulation, compressed air or gas operations, etc.		
	Welding, cutting, laser operations, etc.		
<b>FACE</b> 	Pouring, mixing, painting, cleaning, siphoning, dip tank operations, etc.		
	Welding, pouring molten metal, smithing, baking, cooking, drying, etc.		
	Cutting, sanding, grinding, hammering, chopping, pouring, mixing, painting, cleaning, siphoning, etc.		
<b>HEAD</b> 	Work stations or traffic routes located under catwalks or conveyor belts, construction, trenching, utility work, etc.		
	Construction, confined space operations, building maintenance, etc.		
	Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high tech equipment; arc or resistance welding; etc.		
<b>FEET</b> 	Construction, plumbing, smithing, building maintenance, trenching, utility work, grass cutting, etc.		
	Building maintenance; utility work; construction; wiring; work on or near communications, computer, or other high tech equipment; arc or resistance welding; etc.		
	Welding, foundry work, casting, smithing, etc.		
	Demolition, explosives manufacturing, grain milling, spray painting, abrasive blasting, work with highly flammable materials, etc.		
<b>HANDS</b> 	Grinding, sanding, sawing, hammering, material handling, etc.		
	Pouring, mixing, painting, cleaning, siphoning, dip tank operations, health care and dental services, etc.		
	Welding, pouring molten metal, smithing, baking, cooking, drying, etc.		
<b>BODY</b> 	Pouring, mixing, painting, cleaning, siphoning, dip tank operations, machining, sawing, battery charging, installing fiberglass insulation, compressed air or gas operations, etc.		
	Cutting, grinding, sanding, sawing, glazing, material handling, etc.		
	Welding, pouring molten metal, smithing, baking, cooking, drying, etc.		
	Pouring, mixing, painting, cleaning, siphoning, dip tank operations, etc.		
<b>HEARING</b> 	Machining, grinding, sanding, work near conveyors, pneumatic equipment, generators, ventilation fans, motors, punch and brake presses, etc.  Samples shown are: ear muffs (left) and earplugs (right)		

*NOTE: Pictures of PPE are intended to provide a small sample of what the protection gear may look like. They are not to scale nor are they inclusive of all protection gear required and/or that is available.*