Focus Four
Fall Hazards
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OSHAcademy Course 806 Study Guide

Focus Four – Fall Hazards

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This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 806.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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Course Introduction

Welcome to Focus Four – Fall Hazards for the construction industry. This is the first course covering the hazards described in our Construction Focus Four Hazards series. Please be sure to complete the series by also taking courses 807, 808, and 809. The Focus Four Hazards series was developed in support of the Occupational Safety and Health Administration (OSHA) Construction Outreach Program’s effort to help educate workers in the construction industry about:

- understanding the hazards they face; and
- knowing what their employer’s responsibilities are to protect workers from workplace hazards.

Construction is among the most dangerous industries in the country and construction inspections comprise 60% of OSHA's total inspections. In 2013, preliminary data from the Bureau of Labor Statistics (BLS) indicate that there were 796 fatal on-the-job injuries to construction workers – more than in any other single industry sector and nearly one out of every five work-related deaths in the U.S. that year. Also in 2013, private industry construction workers had a fatal occupational injury rate nearly three times that of all workers in the United States: 9.4 per 100,000 full-time equivalent construction workers vs. 3.2 for all workers.

Given current OSHA and industry information regarding construction worksite illnesses, injuries and/or fatalities, students who complete this series of courses will be able to recognize fall hazards, caught-in or-between hazards, struck-by hazards, and electrocution hazards (focus four hazards) employees face in the construction industry.

Students completing the four courses in the Focus Four Hazards series will be able to recognize fall hazards, caught-in or-between hazards, struck-by hazards, and electrocution hazards employees face in the construction industry.

Specifically, once students complete the Focus Four Hazards series, they will be able to:

- Identify common focus four hazards.
- Describe types of focus four hazards.
- Protect themselves from focus four hazards.
• Recognize employer requirements to protect workers from focus four hazards.
Module 1: What is a Fall Hazard?

Definition

Fall hazards are present at most worksites, and many workers are exposed to these hazards on a daily basis. A fall hazard is anything at your worksite that could cause you to lose your balance or lose bodily support and result in a fall. Any walking or working surface can be a potential fall hazard.

Any time you are working at a height of four feet or more, you are at risk. OSHA generally requires fall protection be provided at four feet in general industry, five feet in maritime and six feet in construction.

However, regardless of the fall distance, fall protection must be provided when working over dangerous equipment and machinery. The importance of fall protection cannot be stressed enough.

Falls from heights are the leading cause of fatalities in construction, while falls on the same level (slips and trips) are one of the leading causes of injuries.

Examples

Fall hazard incidents are injuries produced by impact between the injured person and the source of injury when the motion producing contact was generated by gravity.

Fall hazards in construction cause accidents such as the following:

- A makeshift scaffold collapsed under the weight of four workers and their equipment, seriously injuring all four.

- A worker carrying a sheet of plywood on a flat roof stepped into a skylight opening and fell to the level below.

- A roofer, while attempting to remove a roof opening cover, fell approximately 21 feet to the concrete floor below and was killed.

- A construction worker was working on a carpenters' wall bracket scaffold without fall protection. The worker fell 19 feet to the ground, sustained blunt trauma to the head and later died.
Statistics

BLS found the leading causes of worker deaths in the construction industry were: falls, struck-by object, caught-in or -between, and electrocution. These "Fatal [Focus] Four" were responsible for nearly two out of three (63%) construction worker deaths in 2013, BLS reports. In 2013, falls accounted for more than one-third of fatal occupational injuries in construction (37%). Out of all the fatal falls in private industry in 2013, 42% of them involved construction workers.

Data from a long-term study indicates the types of falls that are causing worker deaths. In the period 1992-2005, about one-third of the fatal falls in construction were from roofs, 18% were from scaffolding or staging, 16% were from ladders, and 8% were from girders or structural steel. The other 25% of fatal falls includes falls through existing floor openings, from nonmoving vehicles, from aerial lifts, etc.

Occupational fatalities caused by falls are a serious concern. This lesson will help you identify fall hazards at construction worksites so you can better protect yourself.

Common Types of Fall Hazards in Construction

Some of the working conditions that contribute to fall hazards include: unprotected edges of elevated work surfaces, including roofs; scaffolds, and ladders; unprotected roof edges; roof/floor openings; and structural steel & leading edges.

Edges and Openings

Major hazards

Almost all sites have unprotected sides and edges, wall openings, or floor holes at some point during construction. If these sides and openings are not protected at your site, injuries from falls or falling objects may result, ranging from sprains and concussions to death.

Many fall hazards could be prevented by designing the hazards out. See: http://www.designforconstructionsafety.org/
Falls to a lower level are a major cause of fatalities in construction. Improperly covered or protected floor holes and openings are a common fall hazard. It’s easy to step into a hole or opening when carrying something that blocks one’s forward view.

Roofing falls are the leading cause of roofing injuries and fatalities. Roofing, siding and sheet metal work have the highest rate of occupational injuries and illnesses for a non-manufacturing industry. One of the most frequently cited serious OSHA violations involving roofing and fall protection is unprotected sides and edges.

Workers involved in steel erection are exposed to fall hazards. According to the Construction Chart Book (CPWR, December 2007), more ironworkers are killed from falls than workers in any other construction occupation. The rate of work-related deaths among ironworkers is 10 times higher than the construction average. The most frequently cited serious OSHA violations involving steel erection are fall protection, fall hazard training and fall protection for connectors.

**Practice Identifying Hazards**

Try to identify the hazards present in each of the pictures on the following pages. Then continue to the next page to see if you correctly identified the hazards.
Workers must be protected from falls over 6 feet.

Worker is exposed to a fall hazard greater than 6 feet, while working near stairwell opening.

Guardrail systems, safety net systems or personal fall arrest systems are required.

Unprotected open-sided floors 6 feet or more above ground level.

Workers working on a balcony of a structure and are exposed to fall hazard due to unprotected side/edge.
Let’s review some examples of potential accidents:

- An ironworker was standing on a tilt-up concrete wall, throwing out bridging. He was wearing a harness and lanyard but was not tied-off. He fell 30 feet to the ground and sustained crushing injuries to his spine, resulting in permanent paralysis below the chest.

  *Recommendations:* The accident could have been prevented if the ironworker had been properly tied off.

- A worker was working on a second-story roof, which was stripped off the original roofing clay tile, felt paper and existing skylights. He was preparing the roof for installation of new materials. While working, he stepped through the removed skylight opening, which was covered only with felt paper. He fell approximately 24 feet to a ceramic tile covered concrete floor and was hospitalized with a head fracture.

  *Recommendations:* Holes, including skylights, must have covers that are capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
Improper Scaffold Construction

Major hazards

Working with heavy equipment and building materials on the limited space of a scaffold is difficult. Without fall protection or safe access, it becomes hazardous. Falls from improperly constructed scaffolds can result in injuries ranging from sprains to death. Guardrails or personal fall arrest systems for fall prevention/protection are required for workers on platforms 10 feet or higher.

The majority of the workers injured in scaffold accidents attribute the accident to factors like the planking or support giving way, or to lack of guardrails or other fall protection. OSHA’s most frequently cited serious scaffold violations include lack of fall protection; scaffold access; use of aerial lifts without body belts and lanyards, platform construction and no worker training.

Practice Identifying Hazards

Try to identify the hazards present in each of the pictures on the following page. Then continue to the next page to see if you correctly identified the hazards.
Lack of fall protection for workers on fabricated frame scaffolds

Planks appear to be overloaded and there is no safe access for workers

The workers are exposed to a 35 foot fall hazard from a scaffold while stacking blocks.
Let’s review some examples of potential accidents:

- A construction worker was working on a carpenters' wall bracket scaffold without fall protection. The worker fell 19 feet to the ground, sustained blunt trauma to the head, and later died.

  *Recommendations: The construction worker should have either been wearing a personal fall arrest system or guardrails should have been attached to the scaffolding. Was the scaffolding assembled properly and inspected by a competent person?*

- A worker preparing masonry fascia for removal from a building fell from the third level of a tubular welded-frame scaffold. No guarding system was provided for the scaffold. Further, the platform was coated with ice, creating a slippery condition.
Recommendations: Again, either guardrails should have been attached to the scaffolding or the worker should have used a personal fall arrest system. Ice must always be cleared away from scaffolding to prevent slippery conditions.
Unsafe Portable Ladders

Major hazards

If a portable ladder is not safely positioned each time you use it, you could fall from the ladder. While you are on a ladder, it may move and slip from its supports. You can also lose your balance while getting on or off an unsteady ladder. Falls from ladders can cause injuries, ranging from sprains to death.

BLS data show that falls from ladders account for more than 100 fatalities each year. Factors that contribute to falls from ladders are ladder slip (top or bottom), overreaching, slipping on rungs/steps, defective equipment, and improper ladder selection for a given task. Frequently cited OSHA ladder violations include:

- not having a portable ladder extend 3 feet above the landing,
- no worker training, and
- improper use of the top of stepladders.

Practice Identifying Hazards

Try to identify the hazards present in each of the pictures on the following page. Then continue to the next page to see if you correctly identified the hazards.
Let’s review some examples of potential accidents:

- A worker was climbing a 10-foot ladder to access a landing, which was 9 feet above the adjacent floor. The ladder slid down, and the worker fell to the floor, sustaining fatal injuries. Although the ladder had slip-resistant feet, it was not secured.

  Recommendations: *The ladder was not tall enough for the task. The ladder needs to extend at least three feet above the landing and have a 4 to 1 angle. The ladder should have been secured.*

- A worker fell approximately 11 feet from an unsecured 24-foot portable extension ladder, which he had leaned against the fascia board above the garage of a house under construction. The worker sustained left leg fracture injuries and was hospitalized.
Recommendations: The ladder needed to be secured. Did the worker receive training regarding how to use the ladder safely?
Module 1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. Which factor contributes to falls from ladders?
   a. Using the 3-point-control method
   b. Overreaching
   c. Selecting the correct type of ladder
   d. Inspecting the ladder before use

2. One of the factors that many workers injured in scaffold accidents attribute their accident to is _____.
   a. conducting inspections of the scaffolding
   b. appropriate fall protection
   c. proper guardrails
   d. planking or support giving way

3. One of the most frequently cited serious OSHA violations involving roofing and fall protection is _____.
   a. body harnesses meeting standards
   b. guardrails being between 39 and 45 inches high
   c. unprotected sides and edges
   d. appropriate training

4. A fall hazard is _____.
   a. anything at your worksite that could cause you to lose your balance or lose bodily support and result in a fall
   b. anything at your worksite that could cause you to be struck by a flying object
   c. anything at your worksite that could cause you to be crushed by equipment
   d. anything at your worksite that could cause you to be pinned between the ground and equipment
5. Factors such as _____ are a common fall hazard.

   a. employees working at heights with appropriate full body harnesses
   b. ladders at a 4:1 angle
   c. frayed electrical cords
   d. improperly covered or protected floor holes and openings
Module 2: Protecting Yourself from Fall Hazards

Use Fall Protection Equipment

The three generally acceptable methods of protection for workers on a construction site who are exposed to vertical drops of 6 feet or more are guardrails, safety net systems, and personal fall arrest systems.

- Guardrails are considered prevention systems, as they stop you from having a fall in the first place.

- Safety net systems are designed to catch you and break your fall. They must be placed as close as practicable beneath your working surface, but never more than 30 feet below.

- A personal fall arrest system consists of an anchorage, connectors, and a full-body harness that work together to break your fall.

In general, it is better to use fall prevention systems, such as guardrails, than fall protection systems, such as safety nets/fall arrest devices. That’s because prevention systems prevent falls from occurring in the first place.

When working next to a fall prevention barrier from an elevated position, such as a step ladder next to a guardrail, the guardrail no longer serves as a fall protection device. Additional protection is needed.

Scaffold work requires guardrails or a personal fall arrest system on any platform **10 feet** or higher. Also, do not climb cross-bracing as a means of access; your employer must provide safe access. Ensure your fall protection equipment is right for the work you are doing, in good condition, and used properly. Remember, your employer needs to provide you with protection to prevent falls at your worksite. Please take a moment to refer to Appendix A to review information regarding, “Guardrail and Safety Net Systems”, and “Personal Fall Arrest Systems”.


Safe Ladder Use

There are many ways you can prevent a fall from a ladder—below are a few suggestions to get you started.

Choose the Right Ladder for the Job

First, you need to make sure a ladder is the best equipment for what you need to do. Would scaffolding or a mechanical lift be better?

Many times, the ladder is the only physical support you have while you are working. If it fails, you can fall. That’s why it is so important to find the right ladder when you do need to use one. The three main types of ladders—step ladders, straight ladders, and extension ladders—are used in different situations for different tasks.

Before you start using a ladder, ask yourself two questions.

Is the ladder long enough? It should be long enough to set it at a stable angle and still extend over the top edge to give you something to hold on to when you get on the ladder to descend. Setting the ladder at the right angle helps you keep your balance on the ladder. It also helps keep the ladder from falling backward.

- Make sure the ladder extends 3 feet (3 rungs; 0.9 meters) above the surface you will be working on.

- Make sure the ladder is placed at a stable angle. For every four feet (1.2m) high the ladder is, the base should be 1 foot (.3 m) out from the wall.

For example, if you will be working on a 10-foot-high roof (3 m), you need a ladder that is at least 14 feet (4.25 m) long. The base should be 2 ½ feet (.75 m) from the wall.

Is the ladder in good working condition? It shouldn’t be missing pieces or be cracked or otherwise damaged. Check the duty rating on extension ladders – is it high enough for the
weight you will be putting on it? Longer ladders don’t always have higher duty ratings, so be sure to check. In construction, the most common ratings are:

- Heavy Duty (I) supports up to 250 pounds (113 kg).
- Extra heavy duty (IA) supports up to 300 pounds (136 kg).
- Special duty (IAA) supports up to 375 pounds (170 kg).

Secure the Ladder

It is necessary to tie the top and bottom of a ladder to fixed points when:

- the ladder doesn’t extend 3’ above the landing,
- it is contacting slippery surfaces; or
- where it could be displaced by work activities or traffic.

Tie both sides of the top of the ladder to a fixed point on the roof or another high surface near where you are working. The bottom should be tied to a fixed point on the ground. Securing the ladder in this way prevents the ladder from sliding side-to-side or falling backward and prevents the base from sliding.

Tying the ladder off at the beginning of the day and untying it at the end of the day will only take you about five minutes. It can make all the difference for your safety. If you need to move the ladder around, allow extra time for this important step or consider using something else, such as a scaffold.
Carrying Tools While Climbing the Ladder

Take precautions when you are going up or down a ladder. Instead of carrying tools, boards, or other materials in your hands, use a tool belt, install a rope and pulley system, or tie a rope around your materials and pull them up once you have reached the work surface. Ask for help if you need to use more than one hand to pull them up.

Carrying tools or anything else in your hands as you climb the ladder can throw you off balance. When you climb a ladder, always use at least one hand to grasp the ladder when going up or down.

Three-Point-Control vs. Three-Point-Contact

What is the difference between the three-point-control method and the three-point contact method?

Three-Point-Contact

The three-point-control method requires a worker to use three limbs for reliable, stable support. The three-point-contact method requires a worker to depend solely on three points of contact with the ladder. Using the stomach or palm are examples of unstable points of contact; these points of contact are unreliable and lead to a false sense of stability.

Though some argue leaning against a surface is acceptable as a point of contact, there is a significant problem with this assumption. For example, if a worker has both feet on a ladder while resting one palm on the roof (three-point contact) they will not be able to prevent a fall if both feet were to slip.

Three-Point-Control

On the other hand, the three-point-control method requires a worker to use three of his or her four limbs for reliable, stable support. This climbing strategy could prevent many of the ladder falls and deaths occurring throughout the United States and world. The three-point-control method requires the worker to place his hand on the ladder in a way to support the full weight of the body if needed in an emergency. The breakaway force from a vertical rail is too great for a worker, male or female, to fully support their weight if only gripping with one hand. During a fall, the hand would slide down the bar until it contacts a rung on the ladder. The hand would most likely disconnect from the ladder when it collides with the rung. A vertical grip can only support approximately 50 percent of person’s bodyweight.
If a worker, using the three-point-control method, has both feet on the ladder and is gripping a horizontal rung (three-point-control), they are much less likely to fall if both of their feet were to slip. When a worker uses a horizontal grip, it allows for about a 75 percent to 94 percent increase in breakaway force. This compares to using a vertical grip, which allows the worker to hold their bodyweight and prevent a fall.

There are seven conditions for using three-point-control while working from ladders.

Because the three-point contact method does not require reliable, stable support, it is not the preferred method to use when on a ladder. They include:

1. Work only for short periods of time.
2. Use light tools and materials designed for single-hand use.
3. Make sure the ladder is stabilized.
4. Keep the ladder at the lowest height possible.
5. Make sure belly button remains between side rails.
6. Keep both feet at the same level.
7. Maintain a horizontal one-hand grip (power grip).

Keeping three-point-control for good support is critical while a worker is climbing, moving or working at an elevation. It is important to note, the three-point-control method is not a substitution for the use of fall protection equipment.

Ladder Angle

A non-self-supporting ladder should have a set-up angle of about 75 degrees — a 4:1 ratio of the ladder’s working length to set-back distance.
Here’s how to achieve it: Stand at the base of the ladder with your toes touching the rails. Extend your arms straight out in front of you. If the tips of your finger just touch the rung nearest your shoulder level, the angle of your ladder has a 4:1 ratio.

The National Institute for Occupational Safety and Health (NIOSH) has developed an easy-to-use interactive ladder safety application for smartphones. The NIOSH Ladder Safety application features a multimodal indicator, which uses visual and sound signals to assist the user in positioning an extension ladder at an optimal angle. Furthermore, the application provides graphic-oriented interactive reference materials, safety guidelines and checklists for extension ladder selection, inspection, accessorizing, and use. The application is intended to help a wide range of ladder users, employers, and safety professionals, with their ladder-related safety needs.

Here is a link to download the phone application:

Android
Apple iOS

Basics of Scaffold Safety

According to the BLS there are thousands of scaffold-related injuries – and about 40 scaffold-related deaths – every year in the U.S. If you are doing work on scaffolds, know how to work on them safely – it could save your life!

Here are some rules about scaffolds that must be followed if you want to work safely:

1. A competent person must be available to direct workers who are constructing or moving scaffolds. The competent person must also train workers, and inspect the scaffold and its components before every work shift, and after any event that could affect the structural integrity of the scaffold. The competent person must be able to identify unsafe conditions, and be authorized by the employer to take action to correct unsafe conditions, to make the workplace safe. A qualified person is someone who has very specific knowledge or training, must design the scaffold and its rigging.
2. Every **supported** scaffold and its components must **support, without failure, its weight and at least four times the intended load**. The intended load is the sum of the weights of all personnel, tools and materials that will be placed on the scaffold. Don’t load the scaffold with more weight than it can safely handle.

3. On **supported** scaffolds, working platforms/decks must be planked close to the guardrails. Planks are to be overlapped on a support at least **six inches**, but not more than **12 inches**.

4. Inspections of **supported** scaffolds must include:
   - Checking metal components for bends, cracks, holes, rust, welding splatter, pits, broken welds and non-compatible parts.
   - Covering and securing floor openings and labeling floor opening covers.

5. Each rope on a **suspended** scaffold must support the scaffold’s weight and at least **six times** the intended load.

6. Scaffold **platforms** must be at least **18 inches wide**, (there are some exceptions), and guardrails and/or personal fall arrest systems must be used for fall protection any time you are working 10 feet or more above ground level. **Guardrails** must be between **39 and 45 inches high**, and **midrails** must be installed approximately halfway between the toprail and the platform surface.

7. OSHA standards require workers to have fall protection when working on a scaffold **10 or more feet** above the ground. OSHA requires the following:
   - The use of a guardrail OR a personal fall arrest system when working on a supported scaffold.
   - **BOTH** a guardrail AND a personal fall arrest system when working on a **single-point or two-point suspended scaffold**.
   - A personal fall arrest system when working on an **aerial lift**.

8. Your lifeline must be tied back to a **structural anchorage** capable of withstanding **5,000 lbs** of dead weight **per person** tied off to it. Attaching your lifeline to a guardrail, a standpipe or other piping systems will not meet the 5,000 lbs. requirement and is not a safe move.
9. Wear hard hats, and make sure there are toe boards, screens, and debris nets in place to protect other people from falling objects.

10. **Counterweights** for *suspended scaffolds* must be able to resist at least **four times** the *tipping moment*. They must also be made of materials that cannot be easily dislocated (no sand, no water, no rolls of roofing, etc.). [This would be calculated by the *qualified person* who designs the scaffold.]

11. Your employer must provide safe access to the scaffold when a platform is more than two (2) feet above or below the point of access, or when you need to step across more than 14 inches to get on the platform. **Climbing on cross braces is not allowed!** Ladders, stair towers, ramps, and walkways are some of the ways of providing safe access.

12. All workers must be trained on:

   - how to use the scaffold, and how to recognize hazards associated with the type of scaffold they are working on;
   - the maximum intended load and capacity;
• how to recognize and report defects;

• fall hazards, falling object hazards and any other hazards that may be encountered, including electrical hazards (such as overhead power lines); and

• having proper fall protection systems in place.

**SOURCE:** Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product.

**Training**

Your employer must provide you with training if you are exposed to fall hazards. The training program must train you to recognize the hazards of falling and explain the procedures to be followed in order to minimize fall hazards. You must also be trained before working on scaffolds and when working with ladders.

**Fall Protection Guidelines for Workers**

1. Understand your company’s written fall protection plan.

2. Attend and participate in fall prevention training.

3. Use fall protection equipment if required for the job. Be sure the equipment is right for the task, fits properly and is in good condition.

4. Inspect fall protection equipment and devices before each use.

5. Make sure sturdy guardrails or covers protect floor holes, open shafts and riser penetrations.

6. Get specialized training before working on scaffolds, lifts or ladders.
7. When using scaffolds, make sure there is proper access, full planking, stable footing and guard railing.

8. Keep your feet firmly on the platform of a boom lift and tie-off at all times.

9. Choose the correct ladder for the task, read the instructions and be sure the ladder is in good condition. Check for surrounding hazards, stable footing and the proper angle.

10. Identify skylights and make sure they are properly protected.

11. Contact your supervisor if you see fall hazards or have any questions about fall prevention. Do not work until unsafe conditions have been corrected.

*OSHA requires employers provide for “prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.”*

### Employer Requirements

**Provide Fall Protection**

OSHA’s fall protection standards require employers to provide fall protection for you when you are exposed to a fall hazard. The standards set the criteria and practices for fall protection systems and required training. The standards cover hazard assessment, fall protection and safety monitoring systems. The standards also address controlled access zones, safety nets, and guardrail, personal fall arrest, warning line and positioning device systems.

Your employer is required to assess the workplace to determine if the walking/working surfaces on which you are to work have the strength and structural integrity to safely support workers.

The employer must not permit you to work on those surfaces until it has been determined that the surfaces have the strength and structural integrity to support all workers.

Once your employer has determined that the surface is safe for workers, they must select one of the permitted types of fall protection for the work operation if a fall hazard is present.

For example, if you are exposed to falling six feet or more from an unprotected side or edge, your employer must select a guardrail system, safety net system, or personal fall arrest system to protect you. There are similar requirements for other fall hazards.
If personal fall protection systems are used, your employer must pay particular attention to identifying attachment points and to ensuring workers know how to properly don and inspect the equipment.

The following are some things your employer should do to prevent fall hazards at your worksite:

1. Develop a written fall protection plan.

2. Identify potential fall hazards prior to each project and during daily walk-arounds. Pay attention to hazards associated with routine and non-routine tasks.

3. Eliminate the need for fall protection where possible by rescheduling the task, isolating the task, or changing the task.

4. Ensure fall protection equipment is appropriate to the task, in good condition and used properly.

5. Conduct general fall prevention training on a regular basis.

6. Train workers about the specific fall hazards identified and the required personal protective equipment.

7. Conduct regular inspections of fall protection equipment in accordance with the manufacturer’s recommendations and OSHA’s requirements.

8. Emphasize fall hazards unique to the site, such as open floor holes or shafts, riser penetrations and skylights.

**Proper Scaffold Construction**

Your employer must construct all scaffolds according to the manufacturer’s instructions. A “competent person” must supervise as scaffolds are erected, moved, taken apart or changed, and must inspect the scaffolding. A guardrail system or a personal fall arrest system is required for scaffolds more than **10 feet** above a lower level. In addition, employers must provide safe access to scaffold platforms.

**Ladder Use and Condition**

Your employer is required to provide ladders where necessary and maintain the ladders in proper condition. They must also train workers to recognize ladder and stairway hazards.
Worksite Maintenance

Poor worksite maintenance can lead to clutter and debris on a construction site, creating additional slip, trip and fall hazards. Poor maintenance of ladders, scaffolds and fall protection equipment can also lead to serious injuries. Your employer is required to keep worksites free of form and scrap lumber with protruding nails and other waste and trash, including combustible debris.

Training

As discussed, your employer must provide you with training on fall hazards and the required personal protective equipment. OSHA also has specific standards requiring your employer to train you when you work with scaffolds and ladders. If you see fall hazards or have any questions about fall prevention, contact your supervisor. Do not work until unsafe conditions have been corrected. If hazards are not corrected, you may contact OSHA and file a complaint.

A competent person is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to workers, and who has authorization to take prompt corrective measures to eliminate them.
Module 2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. In general, fall protection must be provided to construction workers who are working on surfaces with unprotected sides and edges that are _____ above the lower level.
   a. 3 feet   
   b. 4 feet   
   c. 5 feet   
   d. 6 feet

2. What are the ways an employer can protect workers from falls?
   a. Guardrails, safety net systems, and safety belts
   b. Guardrails and safety nets
   c. Guardrails, safety net systems, and personal fall arrest systems
   d. Toeboards, safety nets, and safety belts

3. For workers on scaffolds, fall protection must be provided if they are working _____ above a lower level.
   a. 4 feet   
   b. 6 feet   
   c. 10 feet   
   d. 12 feet

4. Guardrails are often used by employers to protect workers from falls. How high must the top guardrail (the top rail) be above the working surface?
   a. 24 inches, plus or minus 3 inches
   b. 42 inches, plus or minus 3 inches
   c. 52 inches, plus or minus 3 inches
   d. 60 inches, plus or minus 3 inches
5. The top of a ladder must extend at least _____ above the surface you are climbing onto.

   a. 3 feet
   b. 4 feet
   c. 5 feet
   d. 6 feet
Appendix A

Guardrail and Safety Net Systems Summary

Guardrail and safety net systems are two ways to protect workers from falls on the job. If you are more than 6 feet above the lower surface, some type of fall protection must be used by your employer.

If your employer uses guardrails:

- Toprails must be at least 1/4 inch thick to prevent cuts and lacerations; and they must be between 39 and 45 inches from the working surface;
- If wire rope is used, it must be flagged at least every six feet with highly visible materials;
- Midrails, screens or mesh must be installed when there are no walls at least 21 inches high. Screens and mesh must extend from the toprail to the working level.
- There can be no openings more than 19 inches;
- The toprail must withstand at least 200 lbs. of force; the midrail must withstand 150 lbs. of force;
- The system must be smooth enough to protect workers from cuts and getting their clothes snagged by the rail.
- If guardrails are used around holes at points of access, like a ladderway, a gate must be used to prevent someone from falling through the hole, or be offset so that a person cannot walk directly into the hole.

If your employer uses safety nets:

- The nets must be as close as practicable under the working surface, but never more than 30 feet below;
- The safety net must be inspected every week for damage;
- Each net must have a border rope with a minimum strength of 5,000 lbs.;
- The safety net must extend outward a sufficient distance, depending on how far the net is from the working surface (OSHA has a formula to follow);
- The safety net must absorb the force of a 400-pound bag of sand dropping on to the net ("the drop test");
- Items in the net that could be dangerous must be removed as soon as possible.

SOURCE: Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product
Personal Fall Arrest Systems Summary

Personal fall arrest systems are one way to protect workers from falls. In general, workers must have fall protection when they could fall 6 feet or more while they are working.

OSHA requires workers to wear a full-body harness, (one part of a Personal Fall Arrest System) when they are working on a suspended scaffold more than 10 feet above the working surface, or when they are working in bucket truck or aerial lift. Employers may also choose to use a Personal Fall Arrest System, instead of a guardrail, when workers are working on a supported scaffold more than 10 feet above the working surface.

There are three major components of a Personal Fall Arrest System (PFAS):

- the anchor and the anchorage connector
- the connecting device, which is a lanyard or a retractable lifeline, with snaphooks
- the full-body harness

The following are some things to remember about personal fall arrest systems:

1. A personal fall arrest system is made up of an anchorage, connecting device, and a full-body harness. The connecting device may be a lanyard with snaphooks, or a self-retracting lifeline. A lanyard could also include a deceleration device. Make sure you are using components from the same manufacturer to ensure that the system works as it should. If not, any substitution or change must be evaluated or tested by a competent person to ensure that it meets the standard.

2. Body belts cannot be used for fall arresting service. However, a body belt is allowed as part of a positioning system. A positioning system is one way to prevent falls from occurring. It involves equipment for keeping your body in a position where you are not able to fall. For all situations where you could actually fall, you need to wear a full-body harness.

3. Your personal fall arrest system must be inspected for damage each time before you wear it. [If there are defects, or if someone has taken a fall using the equipment, it must be removed from service.]
4. The attachment location of the body harness must be in the center of your back, near the shoulder level or above your head.

5. Vertical lifelines or lanyards must have a minimum breaking strength of 5,000 lbs., and be protected against being cut or abraded.

6. Each worker must be attached to a separate vertical lifeline. [There is a special exception when constructing elevator shafts.]

7. The webbing, which is the materials used for ropes and straps of lifelines, lanyard and harnesses, must be made of synthetic fibers.

8. An anchorage for workers’ personal fall arrest equipment must be independent of any anchorage used to support or suspend platforms, and it must be able to support at least 5,000 lbs. per worker attached to it.

9. Connectors must be made from steel or equivalent materials, with a corrosion-resistant finish and the edges must be smooth.

10. D-rings and snaphooks must have a minimum tensile strength of 5,000 lbs.

11. Snaphooks must be a locking-type (they are generally double-locking) and designed to prevent the snaphook from opening and slipping off the connector.

12. Snaphooks cannot be directly connected to the webbing, rope or wire, to each other, to a D-ring to which another snaphook or other connector is attached, to a horizontal lifeline, or to any other object that could cause the snaphook to open.

Source: Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product
Glossary

**Anchorage**: a secure point of attachment for lifelines, lanyards or deceleration devices.

**Body belt (safety belt)**: a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

**Body harness**: straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

**Buckle**: any device for holding the body belt or body harness closed around the employee's body.

**Connector**: a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

**Controlled access zone (CAZ)**: an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

**Dangerous equipment**: equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

**Deceleration device**: any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

**Deceleration distance**: the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the
onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

**Equivalent:** alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

**Failure:** load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

**Free fall:** the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

**Free fall distance:** the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

**Guardrail system:** a barrier erected to prevent employees from falling to lower levels.

**Hole:** a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

**Infeasible:** that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

**Lanyard:** a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

**Leading edge:** the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.
**Lifeline**: a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

**Low-slope roof**: a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

**Lower levels**: those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

**Mechanical equipment**: all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcarts.

**Opening**: a gap or void 30 inches (76 cm) or more high and 18 inches (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

**Overhand bricklaying and related work**: the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

**Personal fall arrest system**: a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.

**Positioning device system**: a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

**Rope grab**: a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

**Roof**: the exterior surface on the top of a building. This does not include floors or formwork.
which, because a building has not been completed, temporarily become the top surface of a building.

*Roofing work:* the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

*Safety-monitoring system:* a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

*Self-retracting lifeline/lanyard:* a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

*Snaphook:* a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks are generally one of two types:

1926.500(b)(1)

The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or

1926.500(b)(2)

The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.

*Steep roof:* a roof having a slope greater than 4 in 12 (vertical to horizontal).

*Toeboard:* a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.

*Unprotected sides and edges:* any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.
**Walking/working surface:** any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

**Warning line system:** a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

**Work area:** that portion of a walking/working surface where job duties are being performed.

*Source for definitions: CFR 1926.500(b), i.e. OSHA’s definitions for fall protection in the construction industry*
Endnotes