This is the first course covering the hazards described in our Construction Focus Four Hazards series. The Focus Four Hazards series was developed 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. Once students complete this course they will be able to identify common fall hazards, describe types of fall hazards, protect themselves from fall hazards, and recognize employer requirements to protect workers from fall hazards.
OSHAcademy Course 806 Study Guide

Focus Four – Fall Hazards

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Contact OSHAcademy to arrange for use as a training document.

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 employers 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, fall protection must be provided at any height when working over dangerous equipment and machinery.

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.

Quiz Instructions

After each section, there is a quiz question. Make sure to read the material in each section to discover the correct answer to these questions. Circle the correct answer. When you are
finished, go online to take the final exam. This exam is open book, so you can use this study guide.

1. At what height is fall protection generally required when working above dangerous equipment?
   a. Any height  
   b. 4 feet  
   c. 6 feet  
   d. 10 feet

Statistics

In the private sector industry, over 20% of all fatalities were in construction. According to the Bureau of Labor Statistics (BLS) more than half of all work-related falls nationally are due to falls in construction. Over half of all fatal construction falls occur in small construction companies with fewer than 10 employees.

The leading causes of private sector worker deaths in the construction industry were falls, followed by struck by object, electrocution, and caught-in/between. These "Fatal Four" were responsible for about 60% of all construction worker deaths in 2017, BLS reports. Eliminating the Fatal Four would save 582 workers' lives in America every year.

According to The Construction Chart Book (CPWR), most fatalities and nonfatal injuries due to falls are occur in three construction occupations: power-line installers, roofers, and ironworkers. Most fatalities from falls are caused by fall off roofs, ladders, and scaffolds.

Many fall hazards could be prevented by designing the hazards out. for more information and ideas, be sure to bookmark the Prevention Through Design website.
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.
2. Over half of all fatal construction falls are experienced by construction companies with _____ employees.

   a. 10 or more employees  
   b. fewer than 10 employees  
   c. at least 15 employees  
   d. 10-20 employees


**Edges and Openings**

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.

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.

In steel erection, workers on walking/working surfaces with unprotected sides or edges above 15 feet must be protected (There are some exceptions for connectors and workers working in controlled decking zones for heights between 15 and 30 feet.

3. In steel erection, workers on walking/working surfaces with unprotected sides or edges _____ must be protected from falling under most circumstances.

   a. at least 6 feet high  
   b. 10 feet or higher  
   c. above 15 feet  
   d. between 10 and 30 feet

Examples of actual 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 of 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.

4. Covers for holes in floors and working surfaces must ______.
   a. be made of high-strength plastic
   b. have warning symbols
   c. be taped to secure the floor hole being covered
   d. be able to support twice the weight imposed

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 more than 10 feet above a lower level.

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

Lack of fall protection for workers on fabricated frame scaffolds.

The workers are exposed to a 35 foot fall hazard from a scaffold while stacking blocks.

The worker inside the window has no fall protection and there is no guardrail for the window.

The worker below is exposed to struck-by hazards of tools and equipment falling from work above.

A worker is on a carpenter scaffold that has no guardrail, extends too far beyond either end, and isn't wide enough. The worker doesn't have proper access to the scaffold.

Scaffold was not erected with guardrails in areas where workers were working at heights greater than 10 feet.
5. Guardrails or personal fall arrest systems are required for workers on scaffold platforms _____.
   a. at or above 4 feet  
   b. 6 feet or higher  
   c. more than 10 feet  
   d. 30 feet or higher

As you learned earlier, scaffold workers attribute most accidents to weak or defective planking and platforms, a lack of guardrails, and a lack of fall arrest systems. Here are more examples of what can happen when these safety precautions are not taken.

- 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.

6. One of the most common causes for scaffold accidents is attributed to _____.
   a. defective access systems  
   b. no competent person observers  
   c. poorly-built footings  
   d. a lack of guardrails
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.

Bureau of Labor Statistics (BLS) data show that falls from ladders account for more than 100 fatalities each year. The American Ladder Institute (ALI) listed missing the last step and overreaching as the two most common factors causing ladder accidents in 2016. Other common factors that contribute to falls from ladders include:

- wrong size ladder,
- ladder slip (top or bottom),
- failure to maintain three-points of contact
- slipping on rungs/steps,
- defective equipment,
- placing a ladder on soft or uneven ground, and
- improper ladder selection for a given task.
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.
Workers could fall while climbing on the shoring structure to set it up and remove it.

Ladders and lifts must be provided.

Worker is standing on top of the step ladder.

The top of a step ladder shall not be used as a step.

Ladder to work platform is not of sufficient length.

It must extend 3 feet above the working surface.
7. What is listed by the American Ladder Institute (API) as the two most common causes for ladder accidents?

   a. overreaching and ladder slip
   b. slipping on rungs and using the wrong ladder
   c. missing the last step and overreaching
   d. defective equipment and improper ladder selection

Every year OSHA cites employers for violations of ladder safety. 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.

Examples

- 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?
8. OSHA is driving by your worksite and they notice a ladder being used by roofers. What is the most likely violation they will see as they drive by?

   a. Positioning of a 4-to-1 ladder angler
   b. Failure of the ladder to extend 3 feet above the landing
   c. Lack of employee training
   d. Slipping hazards at the base of the ladder
Module 2: Protecting Yourself from Fall Hazards

Hierarchy of Fall Protection

The American National Standards Institute (ANSI)/American Society of Safety Engineers (ASSP) Z359, Fall Protection Code, has identified a hierarchy of fall protection controls, from most effective to least effective. The hierarchy includes:

- **Elimination**. Removing the need to work at an elevated height above the working surface, such as using an extension pole to replace light bulbs. Most effective control.

- **Passive fall protection**. Using physical barriers such as guardrails to prevent a fall.

- **Fall restraint systems**. Using positioning and fall restraint systems that restrict movement to prevent a fall.

- **Fall arrest systems**. Use of full-body harness systems or safety nets, that work together to break a fall.

- **Administrative controls**. The use of policies, procedures, practices, training, and warnings to restrict worker actions and increase awareness of fall hazards. Least effective control.

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.

1. If a fall hazard cannot be eliminated, what would be the next best fall protection strategy according to the hierarchy of fall protection?
   a. Fall restraint systems
   b. Fall arrest systems
   c. Passive fall protection
   d. Administrative controls
**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.

You can open a comprehensive description of the various types of portable ladders at the American Ladder Institute [Ladders 101 webpage](https://www.americanladderinstitute.org).
2. To determine if a ladder is right for the job, ask two basic questions about ladder _____.

a. length and support
b. stability and construction
c. length and stability
d. angle and base

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 feet 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 untlying 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.

3. What precautions should you take to carry tools as you go up and down a ladder?
   a. Place tools in a bag with handles
   b. Lean forward when you carry anything with your hands
   c. Only carry tools with one hand
   d. Carry tools in a tool belt

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

The three-point-control method is preferred because it requires a worker to use either two feet and one hand or one foot and two hands providing greater stability and support. 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 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 support only about half of a person's bodyweight.

If a worker, using the three-point-control method with both feet properly positioned on the ladder and is gripping a horizontal rung, the likelihood of a fall is much less if both of their feet were to slip.

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

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.

4. Which of the following is the preferred method for safely climbing a ladder?
   
   a. Two-Point-Contact  
   b. Three-Point-Contact  
   c. Two-Point-Contact  
   d. Three-Point-Control
Ladder Angle

A non-self-supporting ladder should have a set-up angle of about 75 degrees — a 4:1 ratio of the ladders working length to set-back distance.

Here is 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

5. What is the ratio of a non-supporting ladder's working length to set-back distance?

- a. 3:1
- b. 4:1
- c. 1:4
- d. 1:3

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. A qualified person is someone who has very specific knowledge or training, and is responsible for the proper 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.

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:
   
a. Checking metal components for bends, cracks, holes, rust, welding splatter, pits, broken welds and non-compatible parts.

b. 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; guardrails must be between 39 and 45 inches high; and midrails must be installed approximately halfway between the toprail and the platform surface.

6. **On supported scaffolds, planks are to be overlapped on a support _____**.
   
a. at least six inches, but not more than twelve inches
b. by more than six inches
c. by three inches or more
d. from eight inches to sixteen inches
7. Scaffold platforms must be at least 18 inches wide; guardrails must be between 39 and 45 inches high; and midrails must be installed approximately halfway between the toprail and the platform surface.

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:
   a. how to use the scaffold, and how to recognize hazards associated with the type of scaffold they are working on;
   b. the maximum intended load and capacity;
   c. how to recognize and report defects;
   d. fall hazards, falling object hazards and any other hazards that may be encountered, including electrical hazards (such as overhead power lines); and
   e. having proper fall protection systems in place.

SOURCE: Construction Safety & Health Fall Hazards, Central New York COSH, 2007, OSHA grant product.
7. Which of the following is considered an unsafe means of access to scaffolds?
   a. Using cross braces
   b. Climbing ladders
   c. Using stair towers
   d. Walking up ramps

Training

Your employer must provide you with fall protection training if you are exposed to fall hazards. The training topics must include:

- instruction on how to recognize hazards, perform safe practices, and explain appropriate procedures;
- training with demonstration on how to use fall protection;
- hands-on practice using fall protection in the learning environment; and
- evaluation by a competent person to ensure adequate ability to use the fall protection on the job.

Fall Protection Guidelines for Workers

1. the employer’s fall protection plan
2. use of fall protection equipment
3. inspection of fall protection equipment prior to use
4. requirements for fall protection while working at elevation
5. specialized training before working on scaffolds, lifts or ladders
6. scaffold access, planking, stable footing and guard rail requirements
7. safe practices for using ladders and platforms
8. protection from floor holes and edges
9. reporting fall hazards

8. Which of the following are necessary components of fall protection training?

   a. Instruction, training, and experience
   b. Instruction, training, practice, and evaluation
   c. Training, assessment, verification, and experience
   d. Evaluation, instruction, and training
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 D-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 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:

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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

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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**