

TDI

Safety @ Work
Division of Workers' Compensation

Fall Protection for the Construction Industry



**Workplace
Program**



DISCLAIMER

This Fall Protection for the Construction Industry Workplace Program is a guide to help employers develop a safety plan to comply with the requirements of the [Occupational Safety and Health Administration \(OSHA\) 29 Code of Federal Regulations \(CFR\) 1926, Subpart M](#). It contains helpful information and the basic elements to build a fall protection safety and health program. It is not meant to supersede OSHA requirements. Employers should review the OSHA standard for each specific worksite and customize the program accordingly. This Fall Protection for the Construction Industry Workplace Program is provided as a public service by the Texas Department of Insurance, Division of Workers' Compensation (DWC), and the Texas Occupational Safety and Health Consultation Program (OSHCON). The information in this document was produced, unless otherwise noted, from staff subject specialists, government entities, or other authoritative sources. Information contained in this publication is considered accurate at the time of publication. For more [free DWC publications](#) on this and other safety topics and [free streaming occupational safety and health videos](#), visit www.txsafetyatwork.com, call 1-800-252-7031, option 2, or email resourcecenter@tdi.texas.gov.

INTRODUCTION



Fall protection is a broad concept that includes training, procedures, rules, systems, and methods intended to protect employees from fall hazards. Fall protection does not mean bulky or cumbersome equipment. It does not interfere with work tasks, and it does not get in the way of co-workers – if they understand the concept and apply it appropriately.

Fall protection is a shared responsibility. Employers must be aware of fall hazards and eliminate them, or control employees' exposure to them. Employees are responsible for following the policies, procedures, and training requirements established by their employers. Building owners and managers, architects, engineers, and equipment manufacturers also assume responsibility when involved with a construction project.

This guide is intended to help industry leaders and employees understand the fall protection concepts outlined in [29 CFR 1926, Subpart M](#) and how they apply to the construction industry, including the:

- standard's scope, application, and definitions in [1926.500](#);
- fall protection systems criteria and practices in [1926.502](#); and
- training requirements in [1926.503](#).

In addition, employers and safety managers are encouraged to review the [American National Standards Institute \(ANSI\)/American Society of Safety Professionals \(ASSP\) Standard A10.32-2012, Fall Protection Systems for Construction and Demolition Operations](#).

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OSHA REQUIREMENTS

OSHA's standard for fall protection in construction specifies:

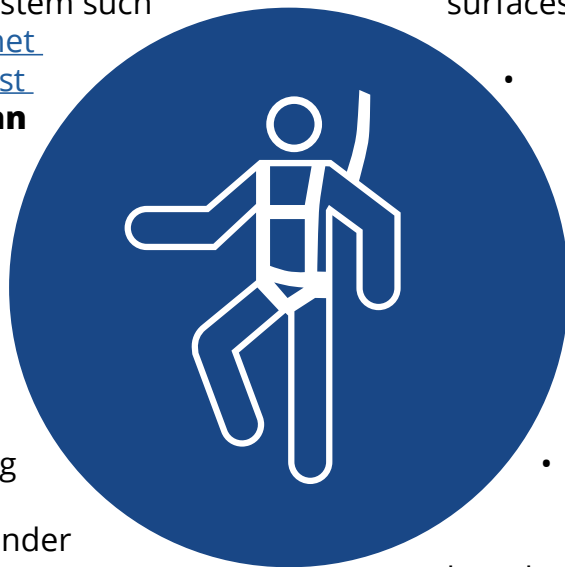
- when fall protection is required;
- appropriate fall protection systems and methods;
- proper procedures for constructing and installing fall protection;

- supervision requirements for employees who use fall protection;
- safe work procedures for employees who use fall protection systems; and
- training requirements for employees who use fall protection systems.

When to Use Fall Protection

OSHA requires employees to use an appropriate fall protection system such as [guardrail systems](#), [safety net systems](#), or [personal fall arrest systems](#) if they are **more than 6 feet above a lower level** when working on or near:

- unprotected sides and edges;
- leading edges;
- walking and working surfaces where leading edges are under construction;
- hoist areas;



- holes in walking and working surfaces;
- formwork and reinforcing steel;
- ramps and walkways;
- excavations;
- dangerous equipment;
- overhand bricklaying and related work;
- low-slope and steep roofs; or
- precast concrete erection.

Requirements for Using Alternative Fall Protection Methods

A [fall protection plan](#) is required when using alternative fall protection methods. If an employee does leading-edge work, precast concrete erection work, or residential-type construction work, fall protection other than guardrail systems, safety-net systems, or personal fall arrest systems can be used only if a fall protection plan demonstrates these systems are either not practical or create a fall

hazard. (See page 19 for guidelines on using a fall protection plan.)



Other Requirements for Special Construction Activities

Although [29 CFR 1926 Subpart M](#) is the primary reference for fall protection requirements in the construction industry, other subparts have fall protection requirements for specific types of construction activities including:

- scaffolds in [Subpart L](#);
- cranes and derricks in [Subpart N](#);
- steel erection work in [Subpart R](#);
- tunneling operations in [Subpart S](#);
- electric transmission lines and equipment in [Subpart V](#); and
- stairways and ladders in [Subpart X](#).

PLANNING & PREPARATION

Careful planning and preparation lay the groundwork for an injury-free workplace. Before beginning a construction project, think about the methods, systems, and procedures that control employees' exposure to fall hazards.

Employers are responsible for foreseeing possible fall hazards at the worksite and the needed fall protection measures in project plans. The nature and scope of the planning effort depend on the project's complexity. For example, larger projects involving multiple contractors and hundreds of employees require more planning than re-roofing a single-family home.

Communication and coordination with customers, contractors, and suppliers are critical elements of the planning process. *Contractors bidding on construction work should include fall protection equipment as a bid item.* This lets customers know the importance the contractor places on complying with OSHA regulations. However, customers must provide enough information to enable contractors to develop bids that include appropriate fall protection systems.

At a minimum, the planning process should identify fall hazards and the systems and procedures that will control the hazards. Effective planning reduces exposure risks for employees during a project and can be used for others after the project is finished. For example, anchor points used by construction workers on a project might also be used to protect window cleaners or other maintenance personnel later.

The following guidelines can help with the planning process:

- Identify all fall hazards that employees are likely to encounter during the project.
- Describe how employees will gain access to the worksite, such as by ladders or stairs.
- Describe how employees will prevent tools and materials from dropping to lower levels.
- Establish procedures for inspecting, maintaining, and storing fall

protection equipment.

- Identify the tasks that expose employees to fall hazards.
- Define how to ensure that employees use fall protection systems appropriate for their tasks.
- Identify anchor point locations.
- Describe the methods for setting anchors and securing lifelines.
- Identify areas in which employees

may be exposed to falling objects and decide how to control the hazards.

- Describe emergency response procedures for rescuing employees who fall.
- Post emergency responders' telephone numbers and make sure employees know where to find them.
- Describe all equipment that will be available for rescuing employees who fall.

FALL PROTECTION SYSTEMS & METHODS

Fall protection refers to equipment designed to control fall hazards. These systems either prevent a fall from occurring ([fall restraint](#)) or safely stop someone in the process of a fall ([fall arrest](#)). They typically consist of:

- a **personal fall arrest system** made up of a body harness, anchorage, and connectors, such as a lanyard, [deceleration device](#), lifeline, or a suitable combination of these;
- a **personal fall restraint system**, which shares the components of a personal fall arrest system, but prevents the worker from reaching fall hazards;
- a **guardrail system** with top rails, midrails, and vertical posts;
- a **safety net system** with a border rope for webbing;
- a **positioning device system** that includes a body belt or harness

rigged to allow for work on a vertical surface;

- a **warning line system** made up of ropes, wires, or chains, and supporting stanchions;
- a **safety monitoring system** that uses a [competent person](#), rather than a mechanical system, to recognize fall hazards and warn workers;
- a **controlled access zone** that restricts unauthorized persons from access; or
- some combination of these systems.

Personal fall arrest systems, guardrail systems, and safety net systems are called **conventional fall protection** and are used in most industries where employees are exposed to falls. Conventional fall protection is typically used when:

- the fall hazard or working at heights cannot be eliminated;
- work needs to be completed on fragile surfaces; or
- when the employee is required to work over the leading edge of a fall hazard.

Positioning devices, warning lines, and safety monitoring systems have more specialized applications. They are used primarily to protect employees doing concrete formwork and roofing tasks.

A **controlled access zone** is a safety measure

for workers at heights where guardrails or fall arrest equipment cannot be used, such as when performing overhand bricklaying. This area must be developed by a qualified person, and a safety monitor is required to supervise the work in this zone.

A **personal fall restraint system**, also known as a work restraint, is most often used if the employee can work continuously at a fixed distance from the anchorage point or if there is limited ground clearance below the work area.

The following sections describe these systems and other methods to protect employees from fall hazards.

Conventional Fall Protection



However, the personal fall arrest system is effective only if the employee knows how all of the components work together to arrest a fall. OSHA's design and performance requirements for personal fall arrest systems are outlined in [29 CFR 1926.502\(d\)](#).

A personal fall arrest system must be installed under the supervision of a [qualified person](#) and must maintain a safety factor of at least two, which is twice the impact

Personal fall arrest system components

A personal fall arrest system consists of an anchor, connectors, and a body harness that work together to stop a person from falling and to minimize the arrest force. Other system components may include a lanyard, a deceleration device, and a lifeline.

force of an employee free-falling 6 feet. OSHA defines a qualified person as "one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to resolve problems related to a specific subject, operation, or project."



Anchors

An anchor provides a secure point of attachment for a lifeline, lanyard, or deceleration device and is perhaps the most important personal fall arrest system component. It must support a minimum load of 5,000 pounds, a challenging requirement, particularly on wood-framed and residential-type structures. The qualified person who designs the personal fall arrest system must know how much weight an anchor will hold. Never use hoists or guardrails as anchors because they are not built to withstand the forces generated by a fall.

Connectors

Connectors join the components of a personal fall arrest system together. Connectors must be [drop forged](#), pressed, made from formed steel, or equally strong material. They must be corrosion-resistant, with smooth surfaces and edges that will not damage other parts of the personal fall arrest system.

D-rings and snap hooks are the most common types of connectors:

- **D-rings** attach the harness to a deceleration device or lanyard and

must have a minimum breaking strength of 5,000 pounds.

- **Snap hooks** consist of a hook and a keeper that opens to receive a connecting component and automatically closes when released. Snap hooks, too, must have a minimum breaking strength of 5,000 pounds. There are two types of snap hooks:
 - **locking snap hooks** that have a self-locking keeper that will not open until it is unlocked and
 - **non-locking snap hooks** that have been determined by OSHA as unsafe. Use only locking snap hooks as part of a personal fall arrest system.

Body Harnesses

The body harness consists of straps that distribute fall arrest forces over the thighs, waist, chest, shoulders, and pelvis. Body harnesses come in many styles, most of which are light and comfortable. A basic harness should include a back D-ring for attaching lifelines, lanyards, or retractable devices, and a back pad for support. A body harness must exert an arresting force of no more than 1,800 pounds on a falling employee. Remember the following when using a body harness:

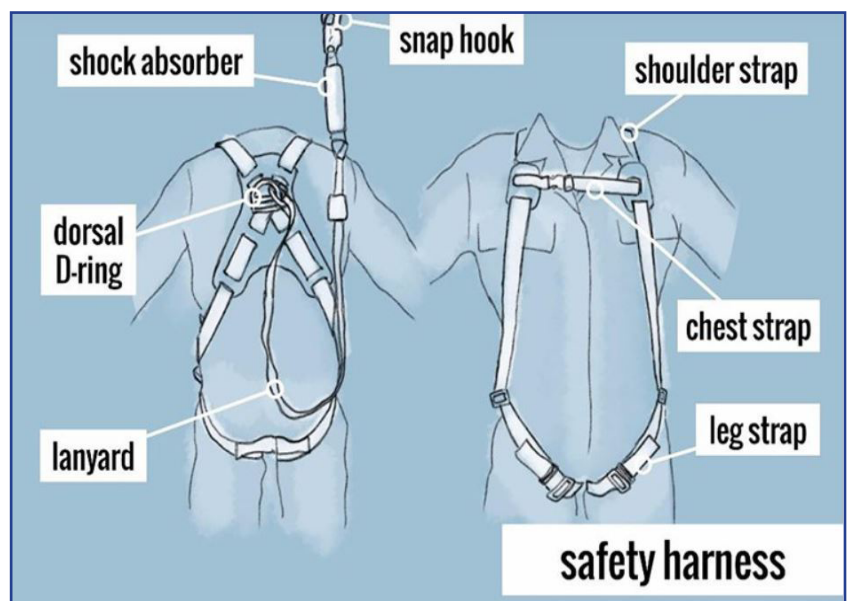
- Body harnesses cannot be made from natural fibers.

- Body harnesses are available in different sizes. Make sure the harness fits properly.
- The attachment point of a body harness must be located in the center of the back, about shoulder level.
- Use only body harnesses approved for commercial work. Do not use recreational climbing harnesses.

Lanyards

A lanyard is a specially designed rope, strap, or webbing that connects a body harness to an anchor, a deceleration device, or a lifeline. Lanyards must have a minimum breaking strength of 5,000 pounds. They come in a variety of designs, including self-retracting types that make moving easier, and shock-absorbing types that reduce fall arrest forces. Remember the following when using a lanyard:

- Self-retracting lanyards that limit free-fall distance to 2 feet or less must have components that hold a minimum load of 3,000 pounds in the fully extended position.
- Self-retracting lanyards that do not limit free-fall distance to 2 feet or less must have components that will hold a minimum load



of 5,000 pounds in the fully extended position.

- When using self-retracting lanyards that do not limit free-fall distance to 2 feet or less, work near or directly below the anchor to avoid swing falls.
- Do not use rope lanyards made from natural fibers.

Deceleration Devices

Fall impact forces on an anchor (and the worker) can be reduced by minimizing the fall distance and using a deceleration device such as a shock-absorbing lanyard or self-retracting lifeline. A third type of deceleration device is the rope grab, a mechanism that allows a worker to move up and down a vertical lifeline. The rope grab automatically locks onto the lifeline if the worker falls. Always follow manufacturers' instructions when using deceleration devices.

Lifelines

A lifeline is a flexible cable or rope that connects to a body harness, lanyard, or deceleration device and at least one anchor. There are two types of lifelines: vertical and horizontal.

- **Vertical lifelines** attach directly to a body harness, lanyard, or deceleration device, and to an anchor that hangs vertically, hence the name. Vertical lifelines must have a minimum breaking strength of 5,000 pounds.
 - **Self-retracting lifelines** are both vertical lifelines and deceleration devices. These consist of a drum-wound line that unwinds and retracts



Clockwise from upper left: self-retracting lifeline, rope grab, shock-absorbing lanyard, and a shock absorber.

from the drum as an employee moves. If the employee falls, the drum automatically locks. Self-retracting lifelines that automatically limit free-fall distance to 2 feet or less must have a minimum breaking strength of 3,000 pounds. Self-retracting lifelines that do not limit free-fall distance to 2 feet or less must have a minimum breaking strength of 5,000 pounds.

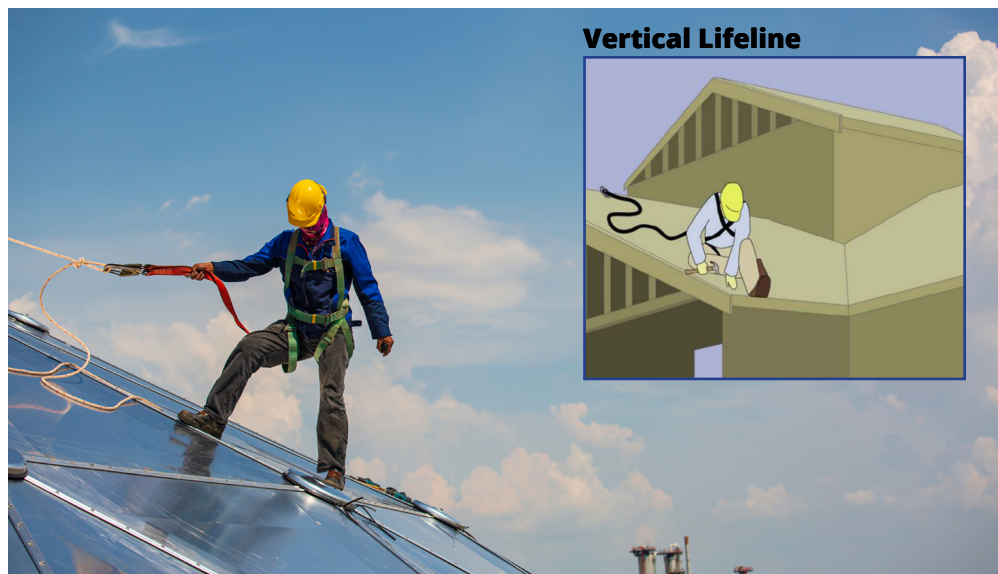
If an employee needs to move horizontally over an extended distance, a vertical lifeline can be hazardous because it creates a potential for a **swing fall**, a pendulum motion that results when a worker swings back under the anchor point.

- **Horizontal lifelines**, unlike vertical lifelines, stretch between two anchors, allowing workers who connect to the line to move freely across a flat surface. Horizontal lifelines and their anchors also must support at least 5,000 pounds per attached employee. However, they are subject to much greater loads than vertical lifelines. If not anchored correctly, horizontal lifelines can fail at the anchor points. For these reasons, horizontal lifelines must be designed, installed, and used under the supervision of a qualified person as part of

a complete personal fall arrest system that maintains a safety factor of at least two, meaning twice the potential impact force of an employee free-falling 6 feet.

Remember the following when using lifelines:

- Protect all lifelines against cuts or abrasions.
- Never use lifelines made from natural fiber rope, which can deteriorate.



- Remove a lifeline from service immediately after a fall arrest system stops a fall, and do not use it until a competent person determines it is safe to return to service. OSHA defines a competent person as one who is capable of identifying existing and predictable hazards in the work environment, and who has the authorization to take prompt measures to eliminate the hazards.

Guidelines for Using Personal Fall Arrest Systems

Knowing how to properly plan, set up, and use a fall arrest system is essential for anyone working on an elevated surface. Remember to follow these guidelines:

- **Plan anchor points.**
Try to anticipate anchor locations before construction work begins. For example, it is possible to design anchors into a building for window cleaning and other maintenance tasks. Properly planned anchors can be used by employees during the construction phase as well. A qualified person must design anchor systems installed during construction.
- **Avoid knots in rope lanyards and lifelines.**
Knots reduce the strength of a lifeline or a lanyard by 50% or more. Avoid using them for tying off to an anchor. Instead, use a locking snap hook designed for that purpose.
- **Avoid tying lifelines or lanyards directly to an I-beam.**
Tying a rope lanyard or lifeline around an I-beam reduces the rope's strength by 70% due to the cutting action of beam edges. Avoid tie-offs around I-beams and any other rough or sharp objects. Use tie-off adapters or beam connectors to anchor a lifeline or lanyard to the beam
- **Understand horizontal lifeline forces.**
Designing and installing horizontal lifeline anchors are critical activities. The reason is related to the geometry of the horizontal lifeline (anchored

at each end) and its sag angle, which is the line's angle of deflection when subjected to a load. Reducing the sag angle on a horizontal lifeline increases the forces imposed on the line during an employee fall. For example, a horizontal lifeline with a 15-degree sag angle will receive twice the impact force as a horizontal lifeline with a 30-degree sag angle. Decreasing the sag angle five degrees increases the impact force by a factor of six. Although two employees can tie off to the same horizontal lifeline, if an employee falls, the line movement could cause the other employee to fall, too, subjecting the line and anchors to even greater impact forces. For these reasons, horizontal lifelines must be designed, engineered, and installed under the supervision of a qualified person.

- **Be cautious with eyebolt connections.**
The strength of an eyebolt is rated along the axis of the bolt, and it is greatly reduced when force is applied at an angle to the axis. Avoid connections to eyebolts that might cause such an effect during a fall.
- **Consider free-fall distances.**
Personal fall arrest systems are designed to stop employees who experience free falls. A free fall is the part of the fall before the arrest system starts to take effect. However, even after the system activates, an employee will continue to fall.

The distance an employee could fall includes:

- the free-fall distance;



- the lifeline stretch from the force of the fall , which cannot exceed 3.5 feet; and
- the distance involved in absorbing the shock (if the employee uses a deceleration device).

If the free-fall distance and lifeline stretch are not taken into consideration, an employee wearing a personal fall arrest system could fall up to 9.5 feet before stopping (6 feet plus 3.5 feet). OSHA limits free falls in construction to 6 feet or less. Therefore, the personal fall arrest system – including stretch and absorbed shock -- must be rigged so that employees do not free fall more than 6 feet, or less if necessary to keep them from striking a lower level.

- **Avoid swing fall risks.**

If an employee is using a personal fall arrest system and is not working directly below the tie-off anchor,

he or she will swing back under the anchor during a fall. Swing falls are especially hazardous because employees can hit an object or a lower level during the pendulum motion. Always think about the potential for a swing fall when connecting a lifeline to a personal fall arrest system.

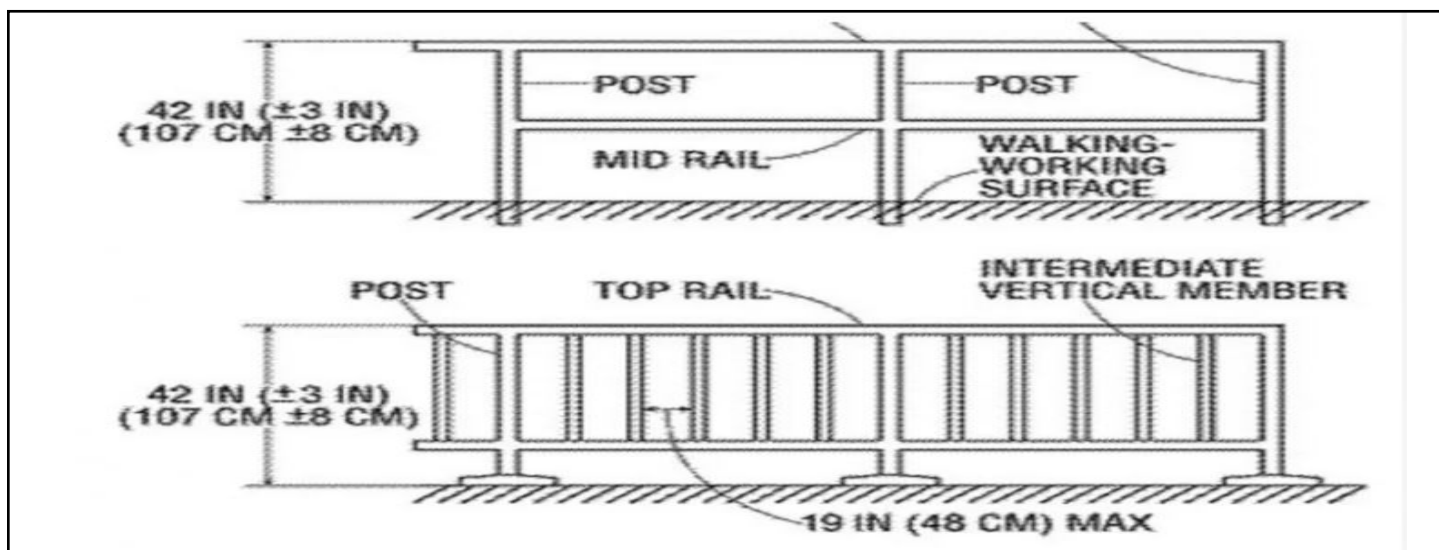
Remember the following about swing falls:

- Fall distance can increase during a swing fall.
- The impact force from a swing fall can be the same as it would be for a vertical fall with the same change of elevation.
- During a swing fall, employees can strike an object or lower level before the arrest system stops their fall.

Guardrail systems

Guardrail systems are barriers consisting of top rails, midrails, and vertical posts. Guardrail systems can also be combined with [toeboards](#), which are barriers that prevent materials and equipment from dropping to lower levels. OSHA design and performance requirements for guardrail systems are found in [29 CFR 1926.502\(b\)](#), and include the following:

- Guardrail systems must be free of anything that might cut an employee or snag an employee's clothing.
- All guardrails must be at least one-quarter inch thick to reduce the risk of hand lacerations.
- Steel or plastic banding is not permitted for top rails or midrails.
- Wire rope used for a top rail must be marked at least every 6 feet with high-visibility material.
- The top edge of a guardrail system must be 42 inches, plus or minus 3 inches, above the surface to which it is attached. The top edge height can exceed 45 inches when conditions warrant. However, the guardrail system must meet all other performance criteria.
- Where there is no wall or parapet at least 21 inches high, screens, mesh, midrails, or similar protection must be installed between the top edge of the guardrail system and the working surface.
- Midrails must be installed midway between the top edge of the guardrail system and the working surface.
- Screens and mesh must extend from the top rail to the working surface.
- Intermediate vertical members between posts must be no more than 19 inches apart.
- The guardrail system must be capable of withstanding a 200-pound force applied within 2 inches of its top edge in any outward or downward direction. Midrails, screens, and intermediate structural members must withstand at least 150 pounds applied in any downward or outward direction.



Safety net systems

Safety net systems consist of mesh nets, panels, and connecting components. They are typically used as protection for those who work 25 feet or more above lower levels on bridges and at building construction sites. OSHA's design and performance requirements for safety net systems are found in [29 CFR 1926.502\(c\)](#), and include the following guidance:

- Keep the net openings to no more than 6 inches on a side, center-to-center.
- Install nets as close as possible – but not more than 30 feet -- below working surfaces.
- Ensure the net can withstand a drop test consisting of a 400-pound, 30-inch diameter bag of sand dropped from a working surface. The net must withstand the impact without touching anything below it.
- Inspect safety nets weekly or after an event that could cause damage.
- Keep the outer edge of a safety net at a minimum of 8 feet



from the edge of the working surface. However, the minimum required distance increases as the net's distance below the working surface increases, as shown in Table 1 below.

- Replace defective nets or components immediately.
- Remove debris that falls into a net no later than the start of the next work shift.

Table 1 - Horizontal and Vertical Safety Net Distances from a Working Surface

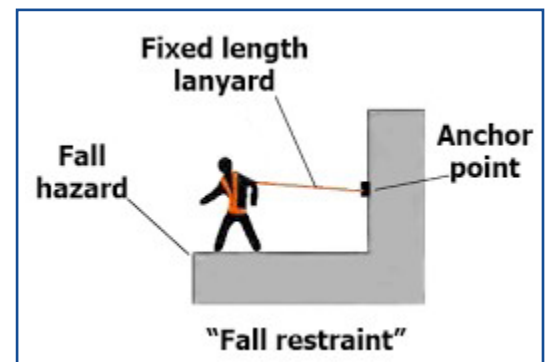
| Net distance below the working surface | Minimum horizontal distance to the net's outer edge |
|--|---|
| Up to 5 feet | 8 feet |
| 5 to 10 feet | 10 feet |
| Greater than 10 feet | 13 feet |

Other Fall Protection Systems & Methods

Fall restraint systems

There is an important difference between fall arrest and fall restraint safety systems. A fall arrest system stops someone in the process of a fall, while a fall restraint system keeps a person from reaching the edge where a fall might occur.

A fall restraint system consists of an anchor, connectors, and a body harness or a safety belt. However, a safety belt can be used as a positioning device only. OSHA no



longer permits safety belts as part of a fall arrest system because they can cause serious damage to the spleen, pancreas, and other internal organs.

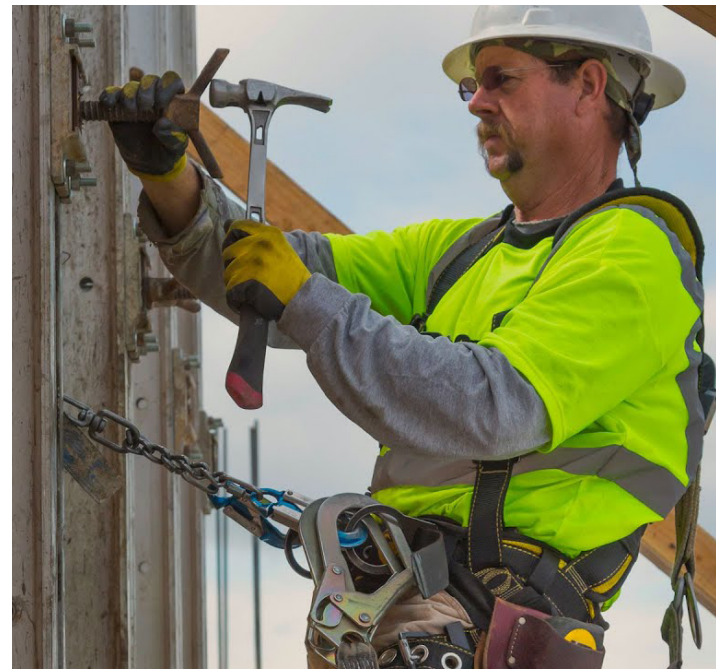
While there are no specific standards for restraint systems, OSHA suggests that, as a minimum, fall restraint systems withstand at least 3,000 pounds of force or twice the maximum expected force needed to restrain the employee from a fall hazard. In determining this force, consider site-specific factors, such as the force generated by a person walking, leaning, or sliding down the work surface.

Positioning device systems

Positioning device systems, also known as Class II work positioning systems, enable employees to work with both hands free on a surface such as a wall or other vertical structure. They are typically used as protection for concrete formwork and placing rebar. The difference between a positioning device system and a personal fall arrest system is that the positioning device system supports a worker on an elevated surface and limits a fall to 2 feet. A personal fall arrest system does not offer support but stops a free fall.

OSHA design and performance requirements for positioning device systems are found in [29 CFR 1926.502\(e\)](#), and include the following guidance:

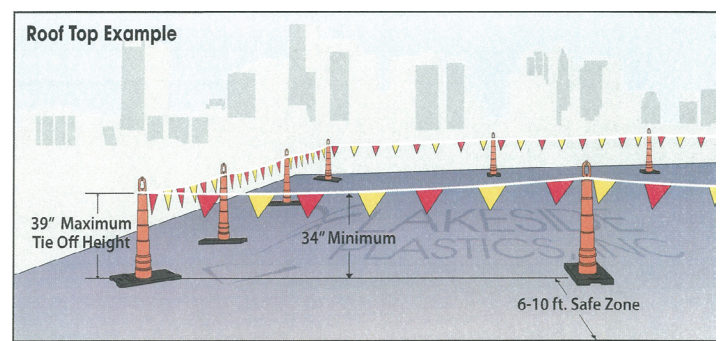
- Positioning device anchors must be able to support at least 3,000 pounds.
- Positioning device components such as D-rings and snap hooks must be proof tested to a minimum tensile load of 3,600 pounds without deforming.



- Always inspect positioning device system components for wear and damage before use.

Warning line systems

Warning line systems consist of ropes, wires, or chains, and supporting stanchions that form a barrier to warn those who approach an unprotected roof side or edge. The lines mark off an area where an employee can do roofing work without using guardrails or safety nets. Warning line systems can be combined with guardrail systems, personal fall arrest systems, or safety monitoring systems to protect those doing roofing work on low slope roofs of 4:12 or less. The design and performance requirements for warning line systems are covered in [29 CFR 1926.502\(f\)](#).



Safety monitoring systems

A safety monitoring system is a set of procedures assigned to a competent person for monitoring and warning employees who may be unaware of fall hazards. A safety monitoring system used in conjunction with a controlled access zone and a fall protection plan is also appropriate in situations where conventional fall protection is not feasible. The design and performance requirements for safety monitoring systems are found in [29 CFR 1926.502\(h\)](#).

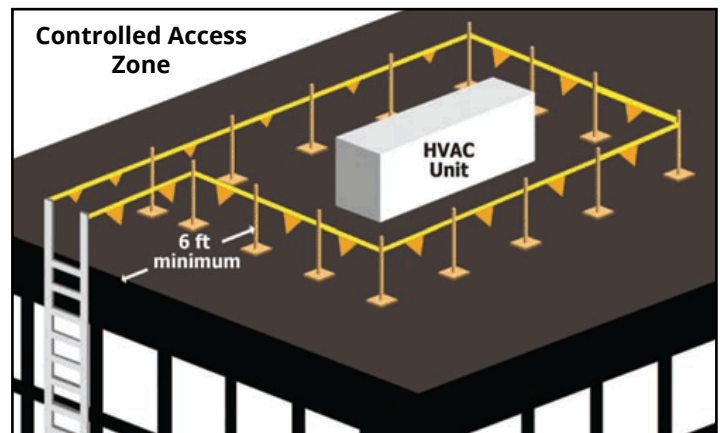
Controlled access zones

The controlled access zone defines an area where employees can do leading edge, overhand bricklaying, and related work, or work under a fall protection plan without using conventional fall protection. All others are prohibited from entering a controlled access zone. The zone is created by erecting a control line, or lines, to restrict access to the area. The control line warns employees that access to the zone is limited to authorized persons.

Control lines must be:

- made of rope, wire, chain, or equivalent materials and supporting stanchions;
- marked or flagged with high-visibility material at least every 6 feet;
- rigged and supported in such a way that their lowest and highest points above the working surface are no more than 39 inches and 45 inches (50 inches in overhand bricklaying operations); and
- have a minimum breaking strength of 200 pounds.

The design and performance requirements for



controlled access zones are found in [29 CFR 1926.502\(g\)](#).

Covers

A cover includes any rigid object used to overlay openings in floors, roofs, and other walking and working surfaces. Covers must be able to support at least twice the maximum anticipated load of employees, equipment, and materials. Covers should have full edge bearing on all four sides. All covers must be color-coded or marked with the word "Hole" or "Cover" and must be secured to prevent accidental displacement. The design and performance requirements for covers are found in [29 CFR 1926.502\(i\)](#).



USING A FALL PROTECTION PLAN

Fall Protection Plan Requirements

A fall protection plan enables employees doing leading edge work, precast concrete erection work, or residential-type construction work to use alternative fall protection systems or methods when conventional systems are not feasible. Under these special circumstances, properly documented fall protection plans give employers the flexibility to use more appropriate methods of fall protection. However, employers must show that conventional systems are not practical or that they pose a greater safety hazard to employees than other fall protection alternatives. In addition, the fall protection plan must meet the following requirements:

- The plan must be prepared by a qualified person specifically for the site where the work will be done.
- The plan must document why conventional fall protection systems

are not feasible and show how alternative methods will reduce or eliminate fall hazards.

- The plan must describe all measures that will be taken to minimize or eliminate fall hazards at the worksite.
- The employer must designate the work area as a controlled access zone.
- Employers who do not use either alternative fall protection measures or conventional systems must use a safety monitoring system to protect employees in the controlled access zone.

OSHA's requirements for fall protection plans are covered in [29 CFR 1926.502\(k\)](#).

Guidelines for Developing a Fall Protection Plan

An effective fall protection plan can protect employees from fall hazards and enhance the overall level of safety at a job site. When developing a fall protection plan, use the following guidelines to keep it in line with OSHA's requirements. OSHA uses these guidelines to verify that fall protection plans meet the intent of [29 CFR 1926.502\(k\)](#).

- **Explain why a conventional fall protection system cannot be used.** Before a fall protection plan can be used, employers must explain why conventional protection methods such as guardrails, safety nets,

personal fall arrest systems, or fall restraint systems are infeasible or would pose a greater safety hazard to employees. Explain why alternative methods such as scaffolds, catch platforms, or aerial lifts should be used. If the hazard cannot be eliminated, explain why. Be specific. The following three examples illustrate what is required:

- If anchors that can hold 5,000 pounds are not available, explain why other personal fall

arrest systems with 2:1 safety factors or fall restraint systems will not protect employees.

- If having employees erect guardrails creates a greater hazard than an alternative method, explain why. Demonstrate why erecting and dismantling a guardrail system creates a greater hazard than an alternative method and why personal fall arrest systems or fall restraint systems cannot be used.
- If a guardrail system is not feasible because it cannot be anchored in a finished surface, consider freestanding guardrail systems. If freestanding systems cannot be used, explain why.
- **Describe how an alternative method will both protect employees and reduce or eliminate fall hazards.**
Include employees' tasks, the fall hazards they will encounter, the location of hazards, and how the alternative method protects them from the hazards. For example, create a form with the following headings:

| Employee Task | Type of Fall Hazard (i.e., a floor opening or unprotected edge) | Location of Fall Hazard | Alternative Protection & How it Reduces or Eliminates the Fall Hazard |
|---------------|--|-------------------------|---|
|---------------|--|-------------------------|---|

- **Appoint a qualified person to prepare the site-specific fall protection plan.**
They must know how to design, use, and install fall protection systems; the limitations of fall protection systems; and the fall hazards associated with the work tasks and processes. This person will prepare and develop a site-specific fall protection plan that identifies the following:

- construction activity (leading edge, residential, or precast concrete erection);
- site address where the plan will be used;
- their name as the person who prepared the plan; and
- date the plan was prepared.

This person must also approve any changes to the plan.

- **Establish controlled access zones where conventional fall protection cannot be used.**

The fall protection plan must identify each area where guardrails, safety nets, or personal fall arrest systems cannot be used, and designate those areas as controlled access zones. In addition, the following is required:

- Describe how to limit access to controlled access zones.
- List procedures on how to allow authorized employees entry into controlled access zones.
- Describe how to identify controlled access zones and separate them from other work areas.

- List procedures to identify employees who can enter controlled access zones.
- **Assign a competent person to supervisory responsibility and plan implementation.**
The assigned competent person must know the site-specific fall protection plan, how to perform work tasks safely, and the hazards associated with those tasks.
- **Document accountability.**
The fall protection plan must describe how employees and supervisors will comply with the plan requirements.
- **Establish a training program.**
All employees covered by a fall protection plan must be trained by a competent person. Document the names of employees who receive fall protection training and training dates. The training program must cover the following:
 - fall hazards that employees will encounter;
 - types of systems that protect employees from falls;
 - employees' responsibilities under the fall protection plan;
 - procedures for assembling, maintaining, and disassembling personal fall arrest systems in case employees move in and out of the area covered by the plan;
- requirements for employees complying with the plan; and
- procedures for retraining when the plan changes, tasks are altered, or employees do not follow the plan.
- **Update the plan when worksite conditions change and affect how employees are protected from falling.**
An onsite qualified person must approve the plan change. The updated plan must include:
 - the site condition changes that resulted in the update;
 - the qualified person's reasons for the update; and
 - the date the qualified person approved the plan changes and their signature.
- **Investigate accidents.**
If an employee covered by a fall protection plan falls or has a near-miss incident, it must be investigated. If necessary, the investigation may result in changes to the plan to make sure similar events do not happen again. The plan must be updated regularly to include and describe all incidents or near misses, and ways to prevent them in the future.
- **Maintain a copy at the job site.**
Keep a copy of the fall protection plan with all approved changes at the job site.

PROTECTING EMPLOYEES FROM FALLING OBJECTS

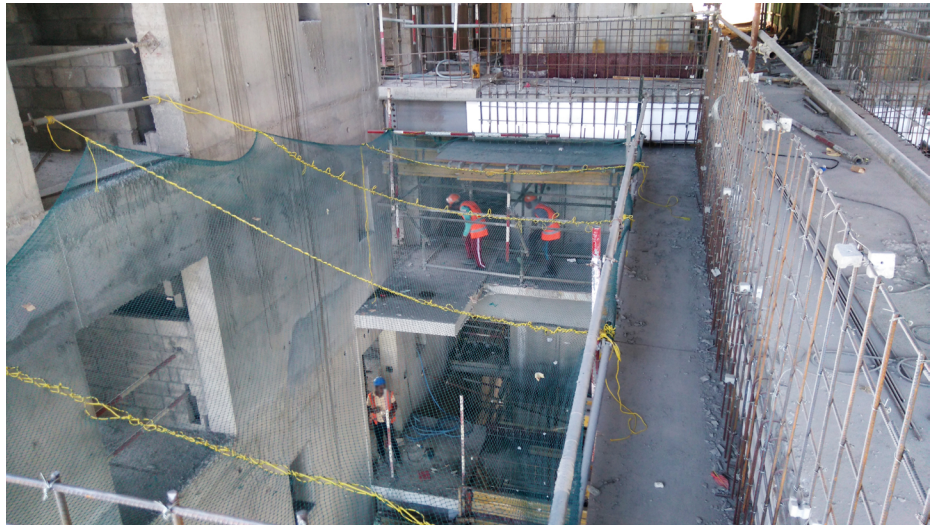
Employees who work on elevated surfaces must be familiar with systems and methods to ensure their equipment and tools do not endanger employees below them. Common methods for protecting employees from falling objects include:

- canopies suspended above the work area;
- barricades and fences to keep people from entering unsafe areas; and
- screens, guardrail systems, and toeboards to prevent materials from falling to lower levels.

OSHA's design and performance requirements for protecting employees from falling objects are found in [29 CFR 1926.502\(j\)](#).

The following guidelines help keep tools and equipment where they belong:

- If using toeboards, they must be strong enough to withstand a force of at least 50 pounds applied in any downward or outward direction.
- Make sure toeboards are at least 3.5 inches high.
- If materials must be piled higher than the top edge of a toeboard, install panels or screens to keep material from dropping over the edge.



- If using canopies as falling-object protection, make sure they will not collapse or tear from an object's impact.
- Guardrails with toeboards can be used as falling-object protection if the guardrail openings are small enough to keep objects from falling through to another level.
- For overhand bricklaying work, keep material and equipment, except masonry and mortar, at least 4 feet from the working edge. Remove excess mortar and other debris regularly.
- For roofing work, keep materials and equipment at least 6 feet from the roof edge unless there are guardrails along the edge. All piled, grouped, or stacked material near the roof edge must be stable and self-supporting.

TRAINING EMPLOYEES ABOUT FALL PROTECTION

Training Requirements

OSHA's standard [29 CFR 1926.503](#) requires employers to provide training to all employees exposed to fall hazards. A competent person must provide training that ensures employees recognize fall hazards and use appropriate procedures to minimize exposure to the hazards. In addition, employees who use personal fall arrest systems must know the proper:

- ways to wear the equipment;
- methods to hookup and attach the equipment;
- anchoring and tie-off distances;
- inspection and storage procedures for the equipment; and
- self-rescue procedures and techniques.



Retraining

Employees must be retrained if they fail to recognize fall hazards at a particular work area. Other reasons for retraining may include:

- changes at a worksite that make earlier training obsolete;
- changes in the types of fall protection equipment used by employees; or
- an employee's failure to use fall protection equipment effectively.

Documentation

Employers must maintain a written record of each employee's fall protection training. The record must document the:

- employee's name;
- date the employee was trained; and
- trainer's signature.

Appendix A of this publication contains a sample checklist to help track workplace fall hazards and fall protection systems. Appendix B provides a sample training record to certify employee training by topic.

INSPECTING & MAINTAINING FALL PROTECTION EQUIPMENT

Fall protection systems and components do not last forever. OSHA's [29 CFR 1926 Subpart M](#) requires those who use fall protection systems to inspect them regularly for wear or damage. It also requires that a competent person train employees to properly inspect and maintain fall protection systems.

Inspection Guidelines

- If using manila, plastic, or synthetic rope for top rails, midrails, or a guardrail system, inspect these items frequently to make sure they maintain the required strength.
 - If using safety nets, inspect them at least once a week for wear and damage. Remove defective nets from service immediately.
 - If using personal fall arrest systems, personal fall restraint systems, or positioning devices, inspect all components for wear and damage each time they are used.
 - Never use a personal fall arrest system that has been used in a fall until a qualified person determines it is safe for use again.
- or pulled. Examine rivets and stitching at hardware attachment points. Pay close attention to any damage or defects that could put a life at risk. Routine inspections should result in removing equipment from service if there are:
- abrasions;
 - broken parts;
 - burn marks;
 - corrosion;
 - deformation;
 - excessive wear;
 - frayed or kinked material;
 - incompatible components;
 - loose or deformed connectors and anchors;
 - mildew; or
 - stress cracks.

What to look for during inspections

When inspecting fall protection equipment, look for stitching that may be broken, burned,

EMERGENCY PROCEDURES & RESPONSE

Fall protection systems are designed to minimize employees' exposure to fall hazards and to reduce the risk of injury if they do fall. Nevertheless, employers must establish

procedures to ensure that employees who fall receive prompt emergency and medical attention. Emergency procedures should identify:

- key rescue and medical personnel;
- equipment available to make a rescue;
- emergency communications procedures;
- retrieval methods; and
- primary first-aid requirements.

Employees in 911 service areas can call for an ambulance. However, first responders may not be trained to rescue an employee suspended in a personal fall arrest system. Emergency procedures in the workplace must ensure the prompt, safe rescue of a suspended employee. Simply calling 911 does not ensure a prompt rescue.

Use the following guidelines to develop emergency response procedures:

Before onsite work begins:

- inform the fire department or other emergency responders of any conditions at the site that may hinder a rescue effort;
- document rescue procedures and make sure they are posted at the worksite;
- post emergency responder phone numbers and addresses at the worksite;
- mark the worksite with signs noting the easiest routes in and out of the site; and
- make sure responders have quick access to rescue and retrieval equipment such as lifts and ladders.



As onsite work progresses:

- maintain a current inventory and location of operational equipment at the site to use for rescue and retrieval and
- re-evaluate and update the emergency response plan if onsite work tasks change.

If an emergency occurs:

- call 911 or other emergency numbers in the emergency response plan;
- direct emergency personnel to the scene and give first responders a clear path to the victim;
- make sure only qualified personnel attempt a rescue;
- prohibit all nonessential personnel from the fall rescue site;
- talk to the fall victim and determine the victim's condition if possible;
- if the victim is accessible, make the victim comfortable and check vital signs; and
- if necessary, administer CPR and attempt to stop bleeding.

Investigating an Incident

Investigating a worksite incident -- a fatality, injury, or near-miss -- provides employers and workers the opportunity to identify hazards in their operations and shortcomings in their safety and health procedures. Most importantly, it enables employers and workers to identify and implement the corrective actions necessary to prevent future incidents. Always follow these guidelines:

- Report fatalities to OSHA within eight hours.
- Report all inpatient hospitalizations, amputations, and losses of an eye within 24 hours of learning about them if they occur within 24 hours of a work-related incident.
- Identify all equipment associated with the incident and put it out of service until the investigation is finished.
- Document what went wrong, step-by-step.
- Have a competent person examine the equipment associated with the incident. If the equipment is damaged, repair or replace it. If the equipment caused the incident, determine how and why.
- Review the fall protection procedures. Determine how to change the procedures to prevent similar incidents. Revise them accordingly.

For more information on fall prevention or other health and safety topics, download or stream any of the Texas Department of Insurance, Division of Workers' Compensation (DWC) free [publications](#), or [workplace safety videos](#).

APPENDIX A:

Sample Job Site Fall Hazard Checklist

Check whether these hazards exist at the worksite.

| Hazard | Yes | No |
|---------------------------|-----|----|
| Hoist areas | | |
| Holes | | |
| Formwork | | |
| Rebar | | |
| Runways | | |
| Excavations | | |
| Dangerous equipment | | |
| Overhand bricklaying | | |
| Floor joists and trussing | | |
| Floor sheathing | | |
| Erecting exterior walls | | |
| Roof trussing and rafting | | |
| Roof sheathing | | |
| Roofing | | |
| Wall openings | | |
| Falling objects | | |

Job Site/Location: _____ Date: _____

Completed by: _____

APPENDIX C:

Regulations and Standards

OCCUPATIONAL SAFETY AND HEALTH STANDARDS FOR GENERAL INDUSTRY

Subpart D, Walking/Working Surfaces

- Fixed Ladders, Ladder Safety Devices [1910.27 \(d\) \(5\)](#)
- Safety Requirements for Scaffolding, Boatswain’s Chair..... [1910.28\(j\)\(4\)](#)

Subpart F, Powered Platforms, Man lifts, and Vehicle-Mounted Work Platforms

- Powered Platforms and Building Maintenance.....[1910.66](#)
- Personal Fall Arrest Systems [1910.66 Appendix C](#) (Mandatory)

Subpart J, Permit-Required Confined Space[1910.146](#)

Subpart R, Special Industries

- Telecommunications..... [1910.268](#)
- Electric Power Generation, Transmission and Distribution [1910.269\(g\)\(2\)](#)

SAFETY AND HEALTH STANDARDS FOR CONSTRUCTION

Subpart E, Personal Protective Equipment

- Body belts, Lifelines and Lanyards.....[1926.104](#)
- Safety Nets[1926.105](#)

Subpart L, Scaffolding

- Fall Protection..... [1926.451\(g\)](#)

Subpart M, Fall Protection

- Scope, Application and Definitions[1926.500](#)
- Duty to Have Fall Protection.....[1926.501](#)
- Fall Protection Systems Criteria and Practices[1926.502](#)
- Training Requirements[1926.503](#)

Subpart R, Steel Erection

- Fall Protection[1926.760](#)

Subpart V, Power Transmission and Distribution

- Linemen Body Belts, Safety Straps and Lanyards[1926.959](#)

Subpart X, Ladders

- Ladders.....[1926.1053](#)

SAFETY & HEALTH REGULATIONS FOR MARINE TERMINALS & LONGSHORING

Shipyards Employment, Personal Fall Arrest Systems[1915.159](#)

Shipyards Employment, Positioning Device Systems[1915.160](#)

Marine Terminals, Employee Protection [1917.112\(b\)](#)

Longshoring, Deck Loads [1918.33\(b\)](#)

Longshoring, Fall Protection [1918.85\(j\) & \(k\)](#)

APPENDIX D:

Glossary

Anchor (anchorage)

A secure point of attachment for employees' lifelines, lanyards, or deceleration devices. Anchors must be capable of supporting a minimum load of 5,000 pounds per employee (or designed, installed, and used under the supervision of a qualified person as part of a complete personal fall arrest system that maintains a safety factor of at least two).

Anchorage connector

A component or system used to join the connecting device (lanyard, lifeline, or deceleration device) to the anchorage.

Arresting force

The force transmitted to the body when a fall is arrested. Also known as fall arrest force.

Body belt

A strap that is secured around the waist and is used for positioning or restraint only. Body belts are not used for fall arrest. Also known as safety belt.

Barricade

An obstruction to deter the passage of persons or vehicles.

Body harness

Straps that an individual wears to distribute fall arresting forces over the thighs, waist, chest, shoulders, and pelvis. Attaches to other components of a personal fall arrest system. The maximum safety arresting force for a body harness is 1,800 pounds.

Body support

Personal protective equipment worn by a worker, such as a body belt or body harness.

Buckle

An integral connector used to attach straps or webbing segments together or to themselves.

Carabiner

A connector component generally composed of a trapezoidal or oval-shaped body with a normally closed gate or similar arrangement which may be opened to permit the body to receive an object and, when released, automatically closes to retain the object. Carabiners used in personal fall protection should be self-closing and self-locking and only be capable of opening with two consecutive actions by the user.

Competent person

A person who is capable of identifying existing and predictable hazards in the work environment and who has the authorization to take prompt measures to eliminate the hazards.

Confined space

An enclosed area that is large enough and so configured that an employee can bodily enter and has the following characteristics: Its primary function is something other than human occupancy, has restricted entry and exit, and may contain potential or known hazards.

Connector

A device used to connect components of a personal fall arrest system. The connector may be an independent component (such as a carabiner) or an integral component (such as a buckle or D-ring) of the system. Connectors must be drop forged or made of equivalent materials, have a corrosion-resistant finish, and all surfaces and edges must be smooth to prevent damage to other parts of the system.

Continuous fall protection

A fall protection system that is designed so that there is no unprotected exposure to an elevated fall hazard.

Controlled access zones

An area designated for overhand bricklaying operations or leading-edge construction. Conventional fall protection systems such as guardrail systems, personal fall arrest systems, or safety net systems are not required in a controlled-access zone; access is restricted to all employees except those performing overhand bricklaying and leading-edge construction tasks.

Conventional fall protection

A guardrail system, safety net system, or personal fall arrest system.

Cover

A rigid object used to overlay openings in floors, roofs, and other walking and working surfaces.

Deceleration device

Any mechanism that dissipates or limits energy imposed on a person during fall arrest. Examples include rope grabs, ripstitch lanyards, special woven lanyards, and automatic self-retracting lifelines.

Deceleration distance

The additional vertical distance an employee falls before stopping, excluding lifeline elongation and free fall distance, from the point at which a deceleration device begins to operate. The distance is measured from the employee's body harness attachment point just before the device activates to the attachment point after the employee comes to a full stop.

D-rings

Attachment points on a body harness for deceleration devices or lanyards. D-rings must be capable of sustaining a minimum tensile load of 5,000 pounds.

Energy-absorber

A component of a personal fall arrest system that allows dissipation of energy by extending deceleration distance reducing fall arrest forces.

Energy-absorbing lanyard

A specially designed lanyard that elongates during a fall to significantly reduce fall arrest forces.

Equivalent

Refers to an alternative design, material, or method that an employer can demonstrate will provide an equal or greater degree of safety for employees than the method or item specified in a standard.

Fall indicator

A safety device or warning flag that serves to let a user know that a component of a personal fall arrest system has been involved in a fall, or has been exposed to equivalent forces, and should be removed from service.

Fall limiter

A self-retracting lifeline/lanyard with a quick-activating braking system that limits a free fall. Refer to self-retracting lifeline/lanyard.

Fall protection plan

Enables employees doing leading edge work, precast concrete erection work, or residential type construction work to use alternative fall protection systems or methods when conventional systems are not feasible to implement a fall protection plan. Employers must be able to show that conventional fall protection systems are not practical or that they add to employee risk.

Fall restraint system

A fall protection system designed to physically prevent an employee from free falling. Components include a body harness, a rope or web lanyard, connectors, and an anchor. Fall restraint systems are not covered in OSHA requirements for fall protection in the construction industry. However, OSHA suggests that, as a minimum, fall restraint systems withstand at least three thousand (3000) pounds of force or twice the maximum expected force that is needed to restrain the person from exposure to the fall hazard.

Fixed anchorage

A stationary anchor point that is capable of supporting at least twice the maximum potential force of the fall arrest system.

Free fall

Falling before fall protection begins to arrest the fall.

Free-fall distance

The vertical distance an employee falls before a personal fall arrest system stops the fall. Distance is measured from the attachment point of the personal fall arrest system immediately before and after the fall, excluding deceleration distance and lanyard and lifeline elongation, but

including deceleration device slide distance or self-retracting lifeline or lanyard extension before fall arrest forces occur.

Friction buckle

An integral connector whereby the webbing passes over the knurled bar and back down between the knurled bar and frame to adjust and tighten webbing straps.

Full body harness

See body harness.

Guardrail system

Barriers erected to prevent employees from falling to a lower level.

Hardware

Buckles, D-rings, snap hooks, and associated connectors used to attach components of a personal fall arrest system or parts of a component within the system.

Hole

Any opening more than two inches wide in a floor, roof, or other walking and working surface.

Horizontal lifeline

A flexible horizontal cable or rope line anchored at both ends to which an employee's body harness or lanyard attaches. Horizontal lifelines must be designed, installed, and used under the supervision of a qualified person, as part of a complete personal fall arrest system.

Ladder climbing safety device

A device that is connected to a harness and fall arrester to prevent a fall from ladders.

Lanyard

A flexible rope, strap, or webbing that connects a body harness to a deceleration device, lifeline, or anchor. Lanyards that tie off one employee must have a minimum breaking strength of 5,000 pounds. Lanyards that automatically limit free fall distance to 2 feet or less must have components capable of sustaining a minimum static tensile load of 3,000 pounds with the lanyard in the fully extended position.

Lanyard ring

A component of a body harness that allows the user to attach a lanyard when not in use so that it is not hanging freely.

Leading edge

The edge of a floor, roof, formwork, or other walking and working surface that changes location as additional sections are placed. Leading edges not actively under construction are considered unprotected sides and edges.

Lifeline

A flexible line that attaches directly to a person's body harness, lanyard, or deceleration device at one end and to an anchor at the other end. A lifeline that hangs vertically and is connected to one anchor is a vertical lifeline. A lifeline that stretches horizontally between two anchors is a horizontal lifeline. All lifelines must be protected against cuts or abrasions. They cannot be made of natural fiber rope.

Locking snap hook

A snap hook that includes a locking mechanism to keep the hook closed and locked until manually unlocked and opened.

Lower level

Surface to which an employee can fall, such as ground levels, floors, ramps, runways, excavations, pits, tanks, material, water, and equipment.

Mating buckle

An integral connector whereby a center bar is pushed through a square link. Webbing is then tightened for proper fit.

Maximum arrest force

The peak force on the body during the arrest of a fall by the fall arrest system. Also known as peak fall arrest force.

Midrails

A rail midway between the guardrail and platform that is secured to the uprights erected along the exposed sides and ends of platforms.

Opening

Any space more than 30 inches high and 18 inches wide in a wall or partition through which employees could fall to a lower level.

Orthostatic intolerance

Refer to suspension trauma.

Overhand bricklaying

Bricklaying and masonry tasks requiring a mason to work while leaning over a wall.

Personal fall arrest system

A conventional fall protection system designed to stop a single employee from free falling to a lower level. Components include an anchor, connectors, a body harness, and may include a lanyard, deceleration device, or lifeline.

Personal fall limiter (PFL)

A self-retracting lanyard with a quick-activating braking system that limits a free fall. In addition, a PFL offers versatility through dual operation by either attaching directly to the harness back D-ring for use as a personal fall limiter or can be used as a traditional retractable lifeline.

Personal lowering device/controlled descent device

A device that provides a means of lowering an individual from a height at a controlled rate of descent.

Platform

A temporary elevated working surface such as the floor of a scaffold.

Positioning device system

A personal fall protection system that supports a person who needs to work with both hands free on surfaces, such as walls or windowsills, and is also used on formwork and for placing rebar.

Qualified person

A person who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to resolve problems relating to a specific subject, operation, or project.

Quick-connect buckle

For leg and chest harness straps that interlock similar to a seat belt for easy use. It features a dual-tab release mechanism to prevent accidental opening.

Residential type construction

Construction work on all types of structures, including commercial buildings, that are framed and covered with materials commonly associated with residential structures. Residential type construction does not include tilt-up buildings, butler type buildings, or large commercial structures.

Retractable lifeline

See self-retracting lifeline or lanyard.

Roll out

A process by which a snap hook, carabiner, or similar device unintentionally disengages from another component to which it is attached.

Rope grab

A deceleration device that moves along a vertical lifeline that automatically engages and locks on the lifeline when an employee falls.

Roof

The exterior surface on the top of a building. Does not include floors or formwork that, if a building is not completed, temporarily becomes the top surface.

Roofing work

Includes hoisting, storing, applying, and removing roofing materials and equipment.

Safety factor

The weight ratio of a breaking load to a safe load. For example, the anchor for a personal fall arrest system must be able to hold at least 5,000 pounds, or it must be installed under the supervision of the qualified person and maintain a safety factor of at least two times the impact force of an employee free falling 6 feet.

Safety monitor system

A fall protection system that requires a monitor (competent person) to be responsible for recognizing fall hazards and warning employees when they are at risk of falling.

Safety net system

A fall arrest system of mesh nets, including panels, connectors, and other impact-absorbing components.

Sag angle

A horizontal lifeline's angle of deflection when the line is subjected to a load.

Scaffold

Any temporary elevated platform and supporting structure used for supporting employees, materials, or both.

Self-retracting lifeline or lanyard

A deceleration device consisting of a drum-wound line that retracts or extends from the drum with normal employee movements; in the event of a fall, the drum automatically locks. Self-retracting lifelines that automatically limit free fall distances to 2 feet or less must have components capable of sustaining a minimum static tensile load of 3,000 pounds. Self-retracting lifelines that do not limit free fall distance to 2 feet or less must be capable of sustaining a minimum tensile load of 5,000 pounds.

Snap hook

A connector, consisting of a hook-shaped member and a keeper that can be opened to receive an object and, when released, automatically closes to retain the object.

Strap

A length of webbing.

Stretchable harness

A full-body harness constructed from webbing that is a blend of nylon, polyester, and a specially-formulated elastomer that stretches. Includes provisions for attaching a lanyard, lifeline, or deceleration device.

Sub-pelvic strap

A full-body harness strap, which passes under the buttocks without passing through the crotch, designed to transmit forces applied during fall arrest or post-fall suspension to the sub-pelvic part of the body.

Suspended scaffold

A scaffold supported on wire or other ropes, used for work on, or for providing access to, vertical sides of structures temporarily.

Suspension trauma (orthostatic intolerance)

A condition that may occur when a person falls and remains suspended both vertical and sedentary for some time. Blood pools in the veins of the legs, which could result in unconsciousness. If a person is not rescued quickly, permanent damage and possibly death may result.

Swing fall

The pendulum motion that results when an employee using a personal fall arrest system falls and swings back under the system's anchor point.

Tie-back lanyard

A flexible line of heavy-duty, abrasion-resistant webbing designed to be used as the connecting device and anchorage connector with a specially-engineered snap hook able to withstand 5,000 pounds on the body and gate.

Tie off

The act of connecting to an anchor. Tied-off means being connected to an anchor.

Tie off adaptor/beam connector

Devices that anchor vertical lifelines or lanyards to I-beams and other objects with rough edges.

Toeboard

A low protective barrier that prevents materials, equipment, and employees from falling to lower levels.

Total fall clearance distance

The maximum vertical distance that a worker could potentially fall and still avoid contact with a lower level.

Total fall distance

The maximum vertical distance between a full-body harness attachment point and the lowest extremity of the body before and after the fall is arrested including lanyard extension and/or deceleration distance.

Tongue buckle

An integral connector similar to a standard belt buckle whereby a webbing strap is inserted through the buckle placing the buckle tongue through the appropriate grommet hole. Also known as a grommet buckle.

Trailing rope grab

A rope grab that moves freely up and down the lifeline with hands-free operation.

Vertical lifeline

A flexible vertical cable or rope line anchored at one end; the other end attaches to an employee's body harness, lanyard, or deceleration device. Each employee must be attached to a separate vertical lifeline. Vertical lifelines must have a minimum breaking strength of 5,000 pounds.

Walking and working surfaces

Any surface (except ladders, vehicles, or trailers) on which employees perform tasks or jobs.

Warning line system

A barrier erected on a roof to warn employees they are approaching an unprotected edge; designates an area for roofing work without conventional fall protection systems (guardrail, safety net, or personal fall arrest).

Warning/barrier lines and barricades

A warning line or barrier erected or installed on a flat elevated surface to designate a safe work area. Employees are not allowed outside the designated safe work area without adequate fall protection.

Work area

The portion of a walking/working surface where employees perform job tasks.