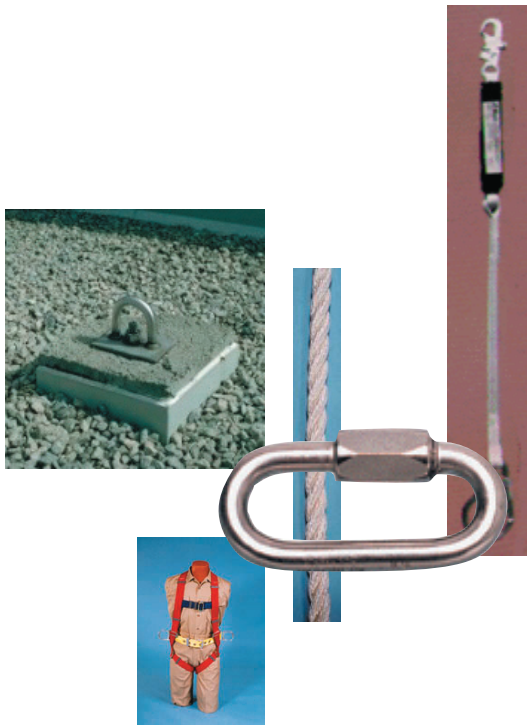




**Texas Department  
of Insurance**



# **Fall Protection for the Construction Industry**

Provided by

Division of  
Workers'  
Compensation

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# Fall Protection for the Construction Industry

## Introduction

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

Fall protection also implies shared responsibilities. If you are an employer, you must be aware of fall hazards and you must eliminate them or control your employees' exposure to them. If you are an employee, you are responsible for following the policies, procedures, and training requirements established by your employer. Building owners and managers, architects, engineers, and equipment manufacturers also have responsible roles to play during a typical construction project.

This guide will help you understand the fall-protection concept and how it applies to the construction industry.

## I. Fall-protection requirements for the construction industry:

Fall-protection requirements for the construction industry are in Subpart M of the Occupational Safety and Health Administration (OSHA) construction standards.

Code of Federal Regulations (CFR) 1926.502 specifies:

- where fall protection is required;
- appropriate fall-protection systems and methods;
- proper fall-protection construction and installation procedures;
- supervision requirements for workers who use fall protection;
- safe work procedures for workers who use fall-protection systems; and
- training requirements for workers who use fall-protection systems.

Subpart M requires those who work on or near the following to use an appropriate fall-protection system – generally, guardrail systems, safety-net systems, or personal fall-arrest systems – if they are six feet or more above a lower level.

- 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, runaways, and other walkways;
- excavations;
- dangerous equipment;
- overhand bricklaying and related work
- low-slope and steep roofs; or
- precast concrete erection;

## A requirement for using alternative fall protection methods: the fall-protection plan

If you do leading-edge work, precast concrete erection work, or residential-type construction work, you can use fall protection other than guardrail systems, safety-net systems, or personal fall-arrest systems – but only if you can demonstrate in a fall-protection plan that these systems are either not feasible or actually create a fall hazard. See section VI for guidelines on using a fall-protection plan.

## Other fall-protection requirements in Subpart M

Though the CFR 1926 Subpart M is the primary reference for fall-protection requirements in the construction industry, other subparts of CFR 1926 have fall-protection requirements for specific types of construction activities. Those requirements and activities are highlighted below.

L – Scaffolds

N - Cranes and derricks

R - Steel erection work

S - Tunneling operations

V - Electric transmission lines/equipment

X - Stairways and ladders

## II. Thinking ahead: the importance of planning and preparation

Before you begin a construction project, think about the methods, systems, and procedures that will control workers' exposure to fall hazards. Careful planning and preparation lay the groundwork for an accident-free workplace. If you are an employer, you are responsible for anticipating fall hazards at your worksite and for including fall protection measures in your project plans. The nature and scope of the planning effort depend on the complexity of the project: Larger projects involving multiple contractors and hundreds of workers obviously require more extensive planning than re-roofing a single-family home.

Communication and coordination – with customers, contractors, and suppliers – are critical elements of the planning process. If you are a contractor bidding on construction work, include fall protection equipment as a bid item. This lets your customers know how you will comply with 1926 Subpart M requirements. However, your customers must give you enough information so you can 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 workers during a project and 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. Use the following guidelines to help you through the planning process

- Identify all fall hazards that workers are likely to encounter during the project.
- Describe how workers will gain access to the worksite (by ladders or stairs, for example).
- Describe how workers 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 workers to fall hazards.
- Make sure workers 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 workers may be exposed to falling objects and decide how to control the hazards.
- Describe emergency-response procedures for rescuing workers who fall.
- Post emergency responders' phone numbers and make sure workers know them.
- Describe all equipment that will be available for rescuing workers who fall.

### III. Protecting workers from falling: systems and methods

#### What is a fall protection system?

A fall protection system refers to equipment designed to control fall hazards. All fall protection systems either prevent a fall from occurring or safely arrest a fall. Typical fall protection systems include the following:

- Personal fall-arrest systems;
- Guardrail systems;
- Safety-net systems;
- Positioning-device systems;
- Warning-line systems;
- Safety-monitoring systems; and
- Controlled-access zones.

Personal fall-arrest systems, guardrail systems, and safety-net systems are called conventional fall protection – they're used in most industries where workers are exposed to falls. Positioning devices, warning lines, and safety monitoring systems have more specialized applications – they're used primarily to protect workers doing concrete formwork and roofing tasks. The controlled-access zone defines an area where one can do leading edge work, overhand bricklaying and related work, or work under a fall protection plan without using conventional fall protection.

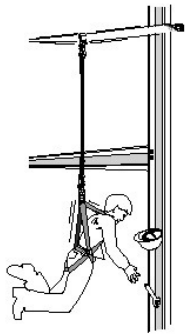
Another system with special applications is the restraint system; it shares the components of a personal fall arrest system, but it's designed to prevent a fall.

This section describes these systems and other methods that protect workers from fall hazards.

#### Conventional fall protection

##### Personal fall arrest systems

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. However, the personal fall arrest system is effective only if you know how all of the components work together to arrest a fall. OSHA's design and performance requirements for personal fall arrest systems are in Subpart M, 1926.502 (d).



#### Personal fall arrest system components

##### The anchor

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. If you don't know how much weight an anchor will



hold, you should have a qualified person design a complete fall protection system. The system must be installed under the supervision of the qualified person and it must maintain a safety factor of at least two – twice the impact force of a worker free-falling six 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.”

Never use hoists or guardrails as anchors. They are not built to withstand the forces generated by a fall.

## Connectors

Connectors couple the components of a personal fall arrest system. D-rings and snap hooks are the most common types of connectors. Connectors must be dropforged, pressed, or made from formed steel or an equally strong material. They must be corrosion-resistant, with smooth surfaces and edges that won't damage other parts of the personal fall arrest system.



The D-ring, a body harness component, attaches to a deceleration device or to a lanyard. D-rings must have a minimum breaking strength of 5,000 lbs.

The snap hook consists of a hook-shaped member and a keeper. It opens to receive a connecting component and when released, automatically closes. Snap hooks must also have a minimum breaking strength of 5,000 lbs. There are two types of snap hooks: locking and non-locking. The locking type has a self-locking keeper that won't open until it's unlocked. OSHA has determined the non-locking type is not safe. Use only locking snap hooks as part of a personal fall arrest system.

## The body harness

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 lbs on a falling worker.



Remember the following when you use 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 lbs; 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 you use a lanyard;

- Self-retracting lanyards that limit free-fall distance to two feet or less must have components that will hold a minimum load of 3,000 lbs with the lanyard in the fully extended position.
- Self-retracting lanyards that do not limit free-fall distance to two feet or less must have components that will hold a minimum load of 5,000 lbs with the lanyard in the fully extended position.
- When using self-retracting lanyards that do not limit free-fall distance to two 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



You can reduce fall-impact forces on an anchor (and yourself) 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 you to move up and down a vertical lifeline. The rope grab automatically locks onto the lifeline if you fall. Always follow manufacturers' instruction when you use deceleration devices.

## Lifelines



A lifeline is 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.

A vertical lifeline attaches directly to a body harness, lanyard, or deceleration device and to an anchor (and hangs vertically, hence the name). Vertical lifelines must have a minimum breaking strength of 5,000 lbs.

The self-retracting lifeline is both a vertical lifeline and a deceleration device. It consists of a drum-wound line that unwinds and retracts from the drum as a worker moves. If the worker falls, the drum automatically locks. Self-retracting lifelines that automatically limit free-fall distance to two feet or less must have a minimum breaking strength of 3,000 lbs. Self-retracting lifelines that do not limit free-fall distance to two feet



or less must have a minimum breaking strength of 5,000 lbs.

If you need to move horizontally over an extended distance, however, the vertical lifeline can be hazardous because it creates the potential for a swing fall – a pendulum motion that results when you swing back under the anchor point.

Unlike the vertical lifeline, the horizontal lifeline stretches between two anchors. When you connect to the line with a body harness, lanyard, or deceleration device, you can move freely across a flat surface. Horizontal lifelines and their anchors are subject to much greater loads than vertical lifelines, however. 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 (twice the potential impact force of a worker free-falling six feet).

Keep in mind that vertical lifelines must support at least 5,000 lbs and horizontal lifelines must support at least 5,000 lbs per attached worker. Protect all lifelines against cuts or abrasions and never use lifelines made from natural fiber rope; the fibers deteriorate.

After a fall arrest system stops a fall, remove it from service immediately and do not use it until a competent person determines that 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 authorization to take prompt measures to eliminate the hazards.

## **Guidelines for using personal fall arrest systems**

**Plan anchor points.** Try to anticipate anchor locations before construction work begins. It’s possible to design anchors into a building for window cleaning or other maintenance tasks, for example. Properly planned anchors can be used by workers during the construction phase, as well. A qualified person must design anchor systems installed during construction.

**Avoid knots in rope lanyards and lifelines.** Knots can reduce the strength of a lifeline or a lanyard by 50 percent or more – avoid using them for tying off to an anchor. Rather, use a locking snap hook designed for that purpose.

**Avoid tying lifelines or lanyards directly to an I-beam.** By tying a rope lanyard or lifeline around an I-beam, you reduce the rope’s strength by 70 percent due to the cutting action of the 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 a worker 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. If you decrease the sag angle to 5-degrees, the impact force increases by a factor of six. Although two workers can tie off to the same horizontal lifeline, if one falls, the line movement could cause the other worker 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’s 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 workers who experience free falls. Free fall is the part of the fall before the arrest system starts to take effect. However, even after the system activates, a worker will continue to fall. The distance a worker falls includes the free-fall distance, the lifeline stretch from the force of the fall, and if the worker uses a deceleration device, the distance involved in absorbing shock. OSHA limits free falls to six feet (less if a worker could strike an object or lower level). Lifeline stretch and deceleration distance cannot exceed 3.5 feet. Therefore, a worker wearing a personal fall arrest system could fall up to 9.5 feet before stopping (six feet plus 3.5 feet). OSHA requires that personal fall arrest systems be rigged so that workers don’t free fall more than six feet or strike a lower level.

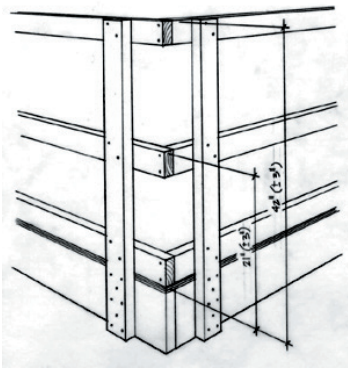
**Avoid swing fall risks.** If you use a personal fall arrest system and are not working directly below the tie-off anchor, you will swing back under the anchor during a fall. Swing falls are especially hazardous because you can hit an object or a lower level during the pendulum motion. Think about the potential for a swing fall whenever you connect a lifeline to a personal fall arrest system. In a recent case, a worker attached a retractable lifeline to a third floor column and moved away from the column. He fell, swinging first onto a lower floor and then striking a lower column. He had extended the lifeline out more than 16 feet and was only eight feet from the ground when he finally stopped swinging.

Remember the following about swing falls:

- Fall distance can actually 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, you can strike an object or lower level before the arrest system stops your fall.

Guardrail systems

Guardrail systems are vertical barriers consisting of top rails, midrails, and intermediate vertical members. 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 in CFR 1926.502 (b), and include the following:



- Guardrail systems must be free of anything that might cut a worker or snag a worker’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 six feet with high-visibility material.
- The top edge of a guardrail system must be 42 inches, plus or minus three 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 lbs force applied within two inches of its top edge in any outward or downward direction. Midrails, screens, and intermediate structural members must withstand at least 150 lbs applied in any downward or outward direction.

Safety net systems

Safety net systems consist of mesh nets, panels, and connecting components. They’re typically used as protection for those who work 25 feet or more above lower levels on bridges and at building construction sites. The maximum net opening can’t be more than 6 inches on a side, center-to-



center. OSHA’s design and performance requirements for safety net systems are in CFR 1926.502 (c). Safety nets must be installed as close as possible below working surfaces, but not more than 30 feet below the surfaces. An installed net must withstand a drop test consisting of a 400 lbs bag of sand 30 inches in diameter dropped from a working surface. The net must be able to withstand the impact without touching anything below it. The outer edge of a safety net must be at least eight feet from the edge of the working surface; however, the minimum distance varies, depending on how far the net is below the working surface. The table below shows the minimum distances.

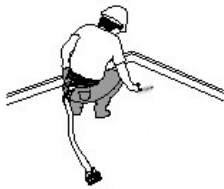
Horizontal and vertical safety net distances form a working surface	
Net distance below the working surface	Minimum horizontal distance of net from the edge of the working surface
Up to 5 feet	8 feet
More than 5 up to 10 feet	10 feet
More than 10 feet	13 feet

Inspect safety nets weekly or after an event that could damage them. Replace defective nets or components immediately. Remove debris that falls into a net no later than the start of the next work shift.

Other fall protection systems and methods

Fall restraint systems

A fall restraint system consists of an anchor, connectors, and a body harness or a body belt. Unlike the personal fall arrest system (designed to stop a fall), the fall restraint system prevents a fall.



The fall restraint system’s anchor must support at least 3,000 lbs. Otherwise, it must be designed, installed, and used under the supervision of a qualified person.

Positioning device systems

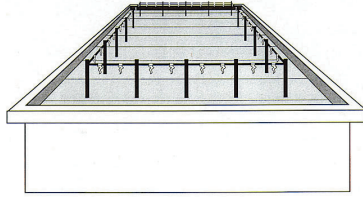
Positioning device systems enable you to work with both hands free on a surface such as a wall or other vertical structure. They’re typically used as protection for concrete formwork and placing rebar. The difference between a positioning device system and a personal fall arrest system is that the positioning device system supports you on an elevated surface and limits a fall to two feet. A personal fall arrest system, on the other hand, doesn’t offer support but stops a free fall. Positioning device systems are also called “Class II” work positioning systems. OSHA design and performance requirements for positioning device systems are in CFR 1926.502 (e).

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

Always inspect positioning device system components for wear and damage before using them.

### 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 within which one 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 (4:12 or less). The design and performance requirements for warning line systems are covered in 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 workers 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. CFR 1926.502 (h) includes the design and performance requirements for safety monitoring systems.

### Controlled access zones

The controlled access zone defines an area where workers 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 workers that access to the zone is limited to authorized persons. Control lines must meet the following criteria:



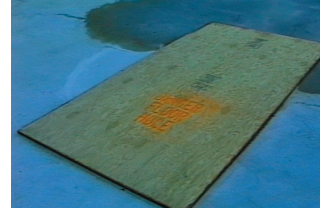
- Consist of ropes, wires, tapes, or equivalent materials and supporting stanchions
- Be flagged at least every 6 feet with high visibility material
- Be no less than 39 inches from the working surface at its lowest point and no more than 45 inches from the working surface at its highest point (50 inches in overhand bricklaying operations)

- Have a minimum breaking strength of 200 lbs.

CFR 1926.502 (g) include the design and performance requirements for controlled access zones.

### 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 workers, 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. CFR 1926.502 (i) includes the design and performance requirements for covers.



## IV. Protecting workers from falling objects

Those who work on elevated surfaces must be familiar with systems and methods that control their exposure to fall hazards; they must also ensure that their equipment and tools don't endanger workers below them. Common methods for protecting workers from falling objects include;

- Canopies suspended above the work area
- Barricades and fences to keep people from entering unsafe areas
- Screens, guardrail systems, and toeboards to prevent materials from falling to lower levels

OSHA's design and performance requirements for protecting workers from falling objects are in CFR 1926.502 (j).

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

- If you use toeboards, they must be strong enough to withstand a force of at least 50 lbs applied in any downward or outward direction. Make sure the toeboards are at least 3 ½ inches high.
- If you need to pile material higher than the top edge of a toeboard, install panels or screens to keep the material from dropping over the edge.
- If you use canopies as falling object protection, make sure they won't collapse or tear from an object's impact.
- You can use guardrails with toeboards as falling object protection if the guardrail openings are small enough to keep the objects from falling through.
- When you do overhand bricklaying work, keep material and equipment – except masonry and mortar – at least four feet from the working edge. Remove excess mortar and other debris regularly.
- When you do roofing work, keep materials and equip-



ment at least six 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.

## **V. Training workers about fall protection**

If you are an employer, you need to be aware of fall hazards at your workplace and you must act to minimize those hazards. Selecting appropriate fall protection is the first step toward meeting that responsibility. The second step is training workers so they are familiar with the fall protection they will use. CFR 1926.503 requires employers to provide training for all workers exposed to fall hazards. A competent person must provide training that ensures workers will recognize fall hazards and use appropriate procedures to minimize exposure to the hazards.

In addition, workers who use personal fall arrest systems must know:

- How to wear the equipment
- The proper hookup and attachment methods for the equipment
- Appropriate anchoring and tie-off distances
- Inspection and storage procedures for the equipment
- Self-rescue procedures and techniques

### **Retraining**

Workers who do not recognize fall hazards at a particular work area must be retrained. Other reasons for retraining include changes at a worksite that make earlier training obsolete, changes in the types of fall protection equipment used by workers, or a worker's failure to use fall protection equipment effectively.

### **Documenting training**

Employers must maintain a written record of each worker's fall protection training. The record must document the worker's name, the date the worker was trained, and the trainer's signature.

In the Appendix, you'll find checklists and a form to help you keep track of fall hazards and fall protection systems at your worksite. Use the checklists to identify fall hazards and fall protection systems. Use the form to certify workers who have been trained to identify workplace fall hazards and use fall protection systems effectively.

## **VI. Using a fall protection plan**

### **Fall protection plan requirements**

A fall protection plan enables workers doing leading edge work, precast concrete erection work, or residential-type construction work to use alternative fall protection systems or methods when conventional systems aren't 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 workers 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 measure or conventional systems must use a safety monitoring system to protect workers in the controlled access zone.

OSHA's requirements for fall protection plans are covered in CFR 1926.502 (k).

### **Guidelines for developing a fall protection plan**

An effective fall protection plan can protect workers from fall hazards and enhance the overall level of safety at a job site. If you decide to develop a fall protection plan, use the following guidelines to keep your plan in line with OSHA's requirements. OSHA will use these guidelines to verify that your plan meets the intent of 1926.502 (k).

Explain why you can't use conventional systems. Before you can use a fall protection plan, you must explain why conventional protection methods – guardrails, safety nets, personal fall arrest, or fall restraint systems – are infeasible or would pose a greater safety hazard to workers than your proposed method. Consider using scaffolds, catch platforms, or aerial lifts. If you can't eliminate the hazard, you must also explain why. Be specific! The following three examples help illustrate the point.

- If anchors that can hold 5,000 lbs are not available, you must also explain why personal fall arrest systems with 2:1 safety factors or fall restraint systems will not protect workers.
- If you believe that having workers erect guardrails creates a greater hazard than an alternative method, you must explain why. You must demonstrate why erecting and dismantling a guardrail system creates a greater hazard than your alternative method and why you can't use personal fall arrest systems or fall restraint systems.

- If you feel that guardrail systems are not feasible because you can't anchor them in a finished surface, you must also consider freestanding guardrail systems that don't put holes in the finished surface. If you can't use freestanding systems, you must explain why.

Describe how your alternative method will protect workers. Describe specifically how your alternative fall protection method will reduce or eliminate fall hazards. Include your workers' tasks, the fall hazards they'll encounter, the location of hazards, and how you intend to protect them from the hazards. You can list your responses in a table such as the one below.

How alternative fall protection methods will reduce or eliminate fall hazards			
The worker's task	The type of fall hazard (such as a floor opening or unprotected edge)	The location of the fall hazard	Alternative protection (how it will reduce or eliminate the fall hazard)

Appoint a qualified person to prepare the plan. A qualified person is someone who has extensive knowledge, training, and experience with fall protection systems. A qualified person must know how to design, use and install fall protection systems; the limitations of fall protections systems; and fall hazards associated with work tasks and processes. You must have a qualified person prepare and develop a site-specific fall protection plan. A qualified person must also approve any changes to the plan. Be sure that the plan identifies the following:

- The construction activity (leading edge, residential, or precast concrete erection)
- The site address where you will use the plan
- The name of the person who prepared the plan (must be a qualified person)
- The date the qualified person prepared the plan

Establish controlled access zones where you can't use conventional protection. Your fall protection plan must identify each area where you can't use guardrails, safety nets, or personal fall arrest systems, and you must designate those areas as controlled access zones. In addition, you must do the following:

- Describe how you will limit access to controlled access zones, including procedures that authorize workers to

enter controlled access zones.

- Describe how you will identify controlled access zones and how you will separate them from other work areas.
- Identify all workers who will enter controlled access zones.

Assign supervisory responsibility to a competent person. A competent person is someone who can identify hazardous conditions and appropriate applications for a fall protection system and who has authority to correct hazards. A competent person must know the site-specific fall protection plan, how to perform work tasks safely, and the hazards associated with those tasks. You must designate a competent person to implement the fall protection plan.

Document accountability. Your fall protection plan must describe how workers and supervisors will comply with its requirements.

Establish a training program. Everyone covered by a fall protection plan must be trained by a competent person. Be sure to document the names of those who receive fall protection training and their training dates. The training program must cover the following:

- Fall hazards that workers will encounter
- Types of systems that will protect workers from falls
- Workers' responsibilities under the fall protection plan
- Procedures for assembling, maintaining, and disassembling personal fall arrest systems
- How workers should comply with the plan
- Retraining procedures when the plan changes, tasks change, or when workers are not following the plan

Update the plan when site conditions change. When work-site conditions change and affect how workers are protected from falling, you must update your fall protection plan so that it addresses the changes. An on-site qualified person must approve the changed plan. The updated plan must:

- Describe the site condition changes that required the update
- Include the qualified person's reasons for the update
- Include the date the qualified person approved the plan changes and the person's signature

Investigate accidents. If a worker covered by a fall protection plan falls or has a near miss incident, you must investigate and, if necessary, change the plan so that similar event will not happen again. The plan must describe near misses or accidents and how to prevent future incidents.

Keep the plan at the job site. You must keep a copy of the fall protection plan, with all approved changes, at the job site.

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## VII. Inspecting and maintaining fall protection equipment

Fall protection systems and components don't last forever. CFR 1926 Subpart M requires those who use fall protection systems to inspect them regularly for wear or damage. CFR 1926 Subpart M also requires that a competent person train the workers to properly inspect and maintain fall protection systems.

### Inspection guidelines

- If you use manila, plastic, or synthetic rope for top rails or midrails or a guardrail system, inspect it frequently to make sure that it maintains its required strength.
- If you use safety nets, inspect them at least once a week for wear and damage. Remove defective nets from service.
- If you use personal fall arrest systems or positioning device systems, inspect them for wear and damage every time you use them.
- If a personal fall arrest system is subjected to a fall, don't use it again until a competent person determines that it's safe.

### What to look for during inspections

- Abrasions
- Broken parts
- Burn marks
- Corrosion
- Deformation
- Excessive wear
- Frayed or kinked material
- Incompatible components
- Loose or deformed connectors and anchors
- Mildew
- Stress cracks

## VIII. Preparing for emergencies

Fall protection systems are designed to minimize workers' exposure to fall hazards and to reduce their risk of injury if they do fall. Nevertheless, employers must establish procedures to ensure that workers who fall receive prompt emergency and medical attention. Emergency procedures should identify key rescue and medical personnel, equipment available for rescue, emergency communications procedures, retrieval methods, and primary first-aid requirements.

Workers in 911 service areas can use this number for ambulance service; however, most 911 responders are not trained

to rescue an injured worker suspended in a personal fall arrest system. Emergency procedures must ensure the prompt rescue of a suspended worker. The 911 number does not ensure a prompt rescue.

Use the following guidelines to develop emergency response procedures.

### Before on-site work begins

Inform 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're 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.
- Make sure responders have quick access to rescue and retrieval equipment such as lifts and ladders.

As on-site work progresses

- Identify on-site equipment that can be used for rescue and retrieval. Examples: aerial lifts, ladders, and forklifts.
- Maintain a current equipment inventory at the site. Equipment may change frequently as the job progresses.
- Re-evaluate and update the emergency response plan if on-site work tasks change.

### If an emergency occurs

- Call 911 or other emergency numbers in the emergency response plan. First responders should clear a path to the victim. Others should direct emergency personnel to the scene.
- Make sure only qualified personnel attempt a technical rescue.
- Prohibit all nonessential personnel from the fall rescue site.
- Talk to the fall victim; determine the victim's condition, if possible.
- If the victim is accessible, make the victim comfortable and check vital signs. If necessary, administer CPR and attempt to stop bleeding.

### Investigating an accident

- Report fatalities and catastrophes to OSHA within eight hours.
- Identify all equipment associated with the accident and put it out of service until the investigation is finished.
- Document what went wrong, step-by-step.
- Review the fall protection procedures; determine how the

- Have a competent person examine equipment associated with the accident. If the equipment is damaged, repair or replace it. If the equipment caused the accident, determine how and why.

## Fall protection checklists and training certification form

Fall-hazard Checklist		
Check all boxes that apply. Check “Yes” if hazards exist at your worksite; check “No” if not.		
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 raftering		
Roof sheathing		
Roofing		
Wall openings		
Falling objects		

Fall protection system checklist				
Fall protection system	Training received			
	N/A	Installation	Maintenance	Dissas- sembly
Guardrail system				
Personal fall arrest systems				
Safety net systems				
Controlled access zones				
Covers				

Safety monitoring systems				
Name of worker:				

You may use this form to record fall protection training; however, whatever method you use to record training must include the name of the employee trained, the training date(s), and the trainer's signature.

[illegible]

## Anchor

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

An obstruction to deter the passage of persons or vehicles.

Straps that an individual wears to distribute fall arresting forces over the thighs, waist, chest, shoulders, and pelvis. Attaches to



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other components of a personal fall arrest system. The maximum safety arresting force for a body harness is 1,800 pounds.

### **Catastrophe**

An event that culminates in the overnight hospitalization of three or more workers from the same incident where medical treatment is rendered.

### **Competent person**

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

### **Connector**

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

### **Controlled access zones (CAZ)**

An area designated for overhand bricklaying operations or leading edge construction. Conventional fall protection systems – guardrail systems, personal fall arrest systems, or safety net systems – are not required in a CAZ; access is restricted to all workers 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, rip-stitch lanyards, special woven lanyards, and automatic self-retracting lifelines.

### **Deceleration distance**

The additional vertical distance a worker 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 worker's body harness attachment point just before the device activates to the attachment point after the worker 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 lbs.

### **Equivalent**

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

### **Fall protection plan**

Enables workers doing leading edge work, precast concrete erection work, or residential type construction work to use alternative fall protection systems or methods when conventional systems aren't 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 worker risk.

### **Fall restraint system**

A fall protection system designed to physically prevent a worker 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's requirements for fall protection in the construction industry.

### **Free fall**

Falling before fall protection begins to arrest the fall.

### **Free fall distance**

The vertical distance a worker falls before a personal fall arrest system stops the fall; 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/lanyard extension before fall arrest forces occur.

### **Guardrail system**

Vertical barriers erected to prevent workers from falling to a lower level.

### **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 a worker'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.

### **Lanyard**

A flexible rope, strap, or webbing that connects body harness to a deceleration device, lifeline, or anchor. Lanyards that tie off one worker must have a minimum breaking strength of 5,000

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pounds. Lanyards that automatically limit free fall distance to two 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.

### **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.

### **Lower level**

Surface to which a worker can fall. Examples: ground levels, floors, ramps, runways, excavations, pits, tanks, material, water, and equipment.

### **Midrails**

A rail midway between the guardrail and platform, 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 workers could fall to a lower level.

### **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 worker from free falling to a lower level. Components include an anchor, connectors, a body harness, and may include a lanyard, deceleration device, or lifeline.

### **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. 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.

### **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.

### **Rope grab**

A deceleration device that moves along a vertical lifeline; it automatically engages and locks on the lifeline when a worker falls.

### **Roof**

The exterior surface on the top of a building. Does not include floors or formwork which, if a building is not completed, temporarily become 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 safe load. For example, the anchor for a personal fall arrest system must be able to hold at least 5,000 lbs or it must be installed under the supervision of the qualified person and it must maintain a safety factor of at least two – two times the impact force of a worker free falling six feet.

### **Safety monitor system**

A fall protection system that requires a monitor (competent person) to be responsible for recognizing fall hazards and warning workers 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 its supporting structure used for supporting workers, materials, or both.

### **Self retracting lifeline/lanyard**

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A deceleration device consisting of a drum-wound line that retracts or extends from the drum with normal worker movements; in the event of a fall, the drum automatically locks. Self-retracting lifelines that automatically limit free fall distances to two 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 two 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.

### **Suspended scaffold**

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

### **Swing fall**

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

### **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 personnel from falling to lower levels.

### **Vertical lifeline**

A flexible vertical cable or rope line anchored at one end; the other end attaches to a worker's body harness, lanyard, or deceleration device. Each worker 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 on ladders, vehicles, or trailers) on which workers perform tasks or jobs.

### **Warning line system**

A barrier erected on a roof to warn workers 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. Workers are not allowed outside the designated safe work area without adequate fall protection.

### **Work area**

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