NATIONAL safety
COMPLIANCE

Fall Protection

Introduction

According to the US Department of Labor, falls account for eight percent of all occupational fatalities from trauma.

In the US, falls are the leading cause of worker fatalities in the construction industry.

On average, between 150 and 200 workers are killed and more than 100,000 are injured as a resul of falls at construction sites.

This program is intended to provide training for both construction and manufacturing employees who are exposed to fall hazards.

OSHA Standards

Various OSHA standards include specific provisions covering fall protection and/or personal fall arrest systems (PFASs) and falling object protection. This program will focus on:

CFR 1910 Subpart D for General Industry

CFR 1926 Subpart M for the Construction Industry.

General Requirements

Fall protection must be provided for each employee on a walking/working surface with an unprotected side or edge at the height required by the OSHA standard applicable to their work place.

- In **General Industry** the elevated height level is **four feet or more above a lower level.**
- In the **Construction Industry** OSHA mandates employers to protect employees from fall hazards and falling objects whenever the employee **is six feet or more above a lower level.** ***In some construction situations the height requirement for protection can be different.***

It is important to know which OSHA regulation is applicable to your work environment and to provide fall protection when required.

General Requirements

Employers must provide protection for employees who are exposed to the hazard of falling into dangerous equipment regardless of height.

Requirements for General Industry

In **General Industry** the elevated height level is *four feet or more above a lower level.*

The four-foot rule applies, but is not limited to:

- Unprotected sides and edges
- Hoist areas
- Holes
- Runways and similar walkways

OSHA allows employers the flexibility to select and provide the fall protection they determine will be most effective in the particular workplace operation or situation to protect their workers and prevent injuries and fatalities from occurring

Requirements for General Industry

Employers can choose from the following fall protection options:

Guardrail system - A barrier erected along an unprotected or exposed side, edge, or other area of a walking/working surface to prevent workers from falling to a lower level.

Safety net system - A horizontal or semi-horizontal, cantilever-style barrier that uses a netting system to stop falling workers before they make contact with a lower level or obstruction..

Requirements for General Industry

Employers can choose from the following fall protection options:

Personal fall arrest system - A system that arrest/stops a fall before the worker contacts a lower level. Consists of a body harness, anchorage, and connector, and may include a lanyard, deceleration device, lifeline, or a suitable combination. *The use of body belts as part of a personal fall arrest system is prohibited*.

Other options include

- **Positioning System,**
- **Travel Restraint System**
- **Ladder Safety System.**

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Requirements for General Industry

If employees are exposed to falling objects, appropriate head protection must be provided and worn.

In addition, employers must protect employees from falling objects by implementing one or more of the following:

- ✓ Erecting toeboards, screens, or guardrail systems to prevent objects from falling to a lower level;
- ✓ Erecting canopy structures and keeping potential falling objects far enough from an edge, hole, or opening to prevent them from falling to a lower level; or
- ✓ Barricading the area into which objects could fall, prohibiting employees from entering the barricaded area, and keeping objects far enough from an edge or opening to prevent them from falling to a lower level. Regardless of height, open-sided floors, walkways, platforms and/or runways above or adjacent to dangerous equipment must be guarded with a standard railing and toeboard.

Requirements for General Industry

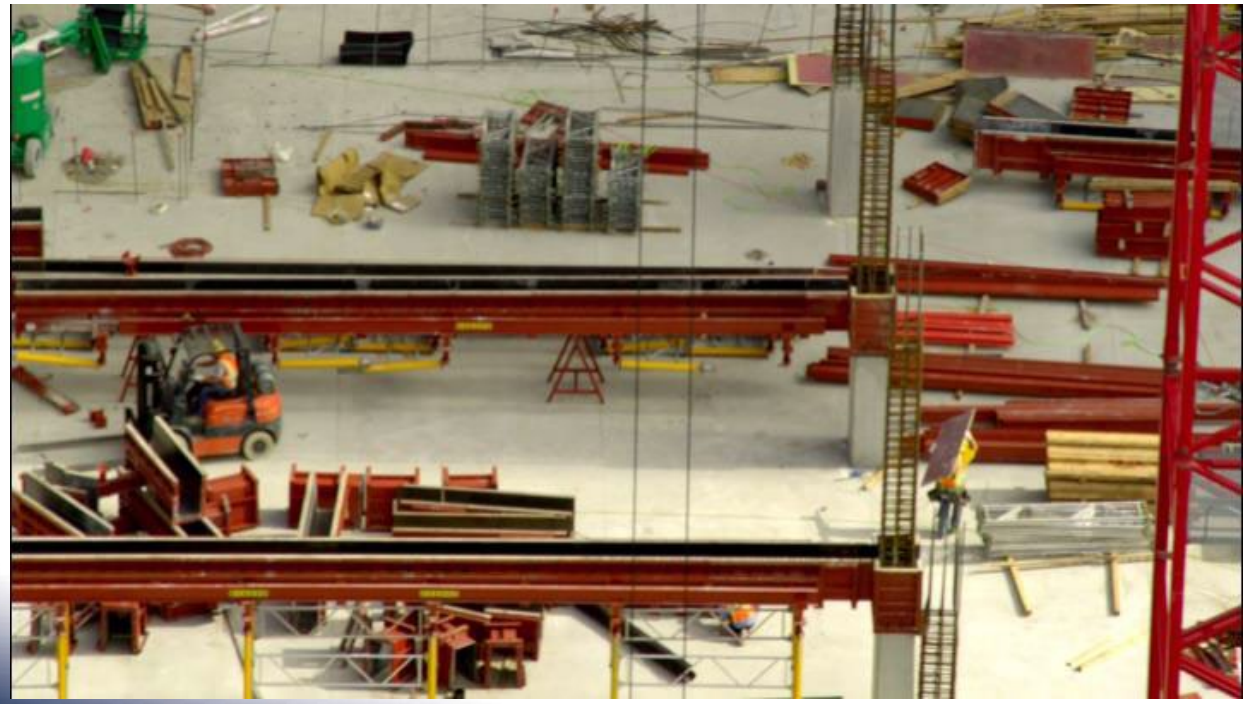
- All floor openings measuring 12 inches or more in its least dimension should be covered or guarded to prevent people from falling or stepping into the area and/or materials from falling into the area.

- Floor openings include: Skylights, stairways, ladderways, hatchways, pit and trapdoors, manholes, and temporary floor openings.

- Every floor hole should also be guarded by either standard railing with toeboard or cover of sufficient strength and construction.

Requirements for Construction Industry

Employers must determine if the walking/working surface has the structural strength to support employees and their tools safely before employees can begin work. Once the employer has determined the surface is safe to work on, they must provide appropriate fall protection if a fall hazard is present.



Requirements for Construction Industry

Areas or activities where fall protection is needed and the type of protection required includes but is not limited to:

- **Unprotected sides and edges** - guardrail, safety net or personal fall arrest system (PFAS)
- **Leading edge work** - guardrail, safety net or PFAS. When it is infeasible or creates a greater hazard to use these systems, an employer may develop and implement a fall protection plan
- **Holes** (including skylights) - PFAS, covers, or guardrail
- **Formwork and reinforcing steel** - PFAS, safety net, or positioning device system

Requirements for Construction Industry

Areas or activities where fall protection is needed and the type of protection required includes but is not limited to:

- **Ramps, runways and other walkways** - guardrail
- **Excavations** – guardrail, fences, barricades, or covers
- **Overhand bricklaying and related work** - guardrail, safety net, PFAS, or controlled access zone
- **Roofing work on low-slope roofs** - guardrail, safety net, PFAS or a combination of warning line system and guardrail system, safety net system, PFAS or safety monitoring system. Roofs less than 50 feet in width may use a safety monitoring system alone.

Requirements for Construction Industry

Areas or activities where fall protection is needed and the type of protection required includes but is not limited to:

- **Residential construction** - guardrail, safety net, or PFAS. When it is infeasible or creates a greater hazard to use these systems, an employer may develop and implement a fall protection plan.
- **Wall openings** - guardrail, safety net, or PFAS

Requirements for Construction Industry

To protect employees from falling objects, employers must:

- ✓ Ensure employees wear hard hats
- ✓ Erect toeboards, screens or guardrail system
- ✓ Erect a canopy structure
- ✓ Barricade the area to which objects could fall.

Types of Fall Protection

OSHA established fall protection requirements for many specific situations such as hoist areas, runways, areas above dangerous equipment, wall openings, repair pits, and scaffolding to name a few. While employers have options to choose from concerning fall protection, in general, it is better to use fall prevention systems, such as guardrails, rather than fall protection systems such as safety nets or fall arrest devices.

Make sure you are using fall protection as required by OSHA.

Types of Fall Protection

Guardrail Systems

The top rail must be between 39-45 inches above the walking surface

Be at least one-quarter inch thick

Be able to withstand a force of at least 200 pounds applied within 2 inches of the top edge in any outward or downward direction at any point along the rail.

Types of Fall Protection

Guardrail Systems

When using cable as a top rail, it must be flagged at not more than six feet intervals with high visibility material.

The mid rail must be one half the distance from the walking surface to the top of the top rail.

Top rails and mid rails must be at least one-quarter inch thick.

Types of Fall Protection

Guardrail Systems

Intermediate members, mid rails and screens must be able to withstand 150 pounds of pressure in any outward or downward direction.

Intermediate vertical members must be installed no more than 19 inches apart.

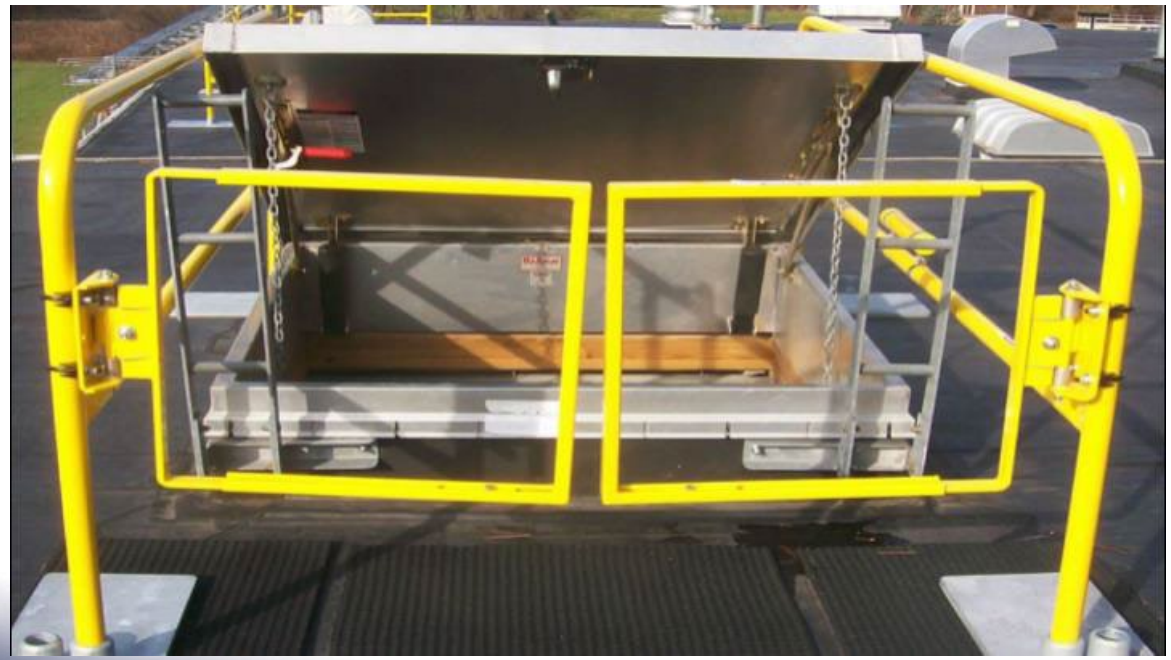
Guardrail's surfaces must be smooth.

Rails should not extend past a terminal post.

Types of Fall Protection

Guardrail Systems

Guardrails around access areas must have a self-closing gate that slides or swings away from the hole or the point of access and must be offset to prevent accidental walking into the hole. The gate should be in place at all times, except when access area is being used.



Types of Fall Protection

Safety Net Systems

Should be installed as close as practicable under the walking-working surface and never more than 30 feet below such levels.

Maximum size of each net mesh opening must not be longer than 6 inches on any side.

Nets must have a border rope for webbing with a minimum breaking strength of 5,000 pounds.

Types of Fall Protection

Safety Net Systems

Safety nets must be drop-tested at the job site after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at six-month intervals if left in one place.

Nets should be inspected weekly for wear, damage and/or deterioration. Defective nets/components should be removed from service.

Objects which have fallen into the safety net, such as debris and tools, must be removed as soon as possible

Types of Fall Protection

Covers

Used to keep employees from falling through holes in walking/work surfaces.

Must be able to support at least twice the axle weight of the largest vehicle that might drive over the cover and at least two times the weight of employees, equipment and materials that may be imposed on the cover at any one time.

Should be well-secured to prevent accidental movement.

Should be marked with the word “HOLE” or “COVER.”

Types of Fall Protection

Personal Fall Arrest System (PFAS)

OSHA defines **Personal Fall Arrest System (PFAS)** as a system used to arrest an employee in a fall from a working level. Each component of the system must be able to withstand the amount of impact forces involved with stopping an employee that is falling. The farther an employee falls, the greater the force needed to stop them

Types of Fall Protection

Personal Fall Arrest System (PFAS)

PFASs must:

- ✓ Limit maximum arresting force on an employee to 1,800 lbs
- ✓ Be rigged so that an employee cannot free fall more than 6 feet nor contact any lower level
- ✓ Bring an employee to a complete stop and limit deceleration distance an employee travels to 3.5 feet

Types of Fall Protection

Personal Fall Arrest System (PFAS)

PFASs must:

- ✓ Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet or the free fall distance permitted by the system, whichever is less
- ✓ Sustain the employee within the system/strap configuration without making contact with the employee's neck and chin area

Types of Fall Protection

Personal Fall Arrest System (PFAS)

PFASs must:

- ✓ Be inspected before each use for wear, damage and other deterioration. Defective parts must be removed from use
- ✓ Be used, stored and replaced according to manufacturer's guidelines.

Never attach PFASs to guardrails, hoists or roof edges or in areas that can cause an employee to swing.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

PFASs consist of anchorage points, body harness, lanyards, lifelines, and connectors.

Anchorage - A secure point of attachment for lifelines, lanyards or deceleration devices

Anchorages used for attachment of PFA equipment must be independent of any anchorage being used to support or suspend platforms.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

PFASs consist of anchorage points, body harness, lanyards, lifelines, and connectors.

Anchorage must be capable of supporting 5,000 lbs. per employee attached or be designed, installed and used:

- as part of a complete PFAS which maintains a safety factor of at least two

- under the supervision of a qualified person.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

A **qualified person** is defined as one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Body Harness - Device of straps worn by an employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a PFAS.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Body Harness:

- Straps should make an “X” on the back and should not be twisted.

- Attachment point should be located in the center of the wearer's back near shoulder level

  - OSHA limits maximum arresting force on an employee to 1,800 lbs with use of a body harness

    - Body belts cannot be used as part of a PFAS

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Connectors: Device which is used to connect parts of the PFAS and positioning devices together.

Connectors includes:

- **D-rings and snaphooks**

  Must have a minimum breaking point of 5,000 pounds.

  Must be proof-tested to a minimum breaking load of 3,600 pounds without cracking, breaking, or suffering permanent deformation.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Connectors includes:

- **D-rings and snaphooks**

Snaphooks must be locking type.

Unless the snaphook is a locking type and designed for the following connections, they should not be engaged: directly to webbing, rope or wire rope; to each other; to a D-ring to which another snaphook or connector is attached; to a horizontal lifeline; or

to any object which is incompatibly shaped or dimensioned such that unintentional disengagement could occur.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Connectors includes:

- **Lifelines** Serves as a means for connecting other components of a PFAS to the anchorage.

Vertical - flexible line for connection to an anchorage at one end to hang vertically. May only be used by one person and with a rope grab

Horizontal - flexible line for connection to an anchorage at both ends to stretch horizontally. Can only be used as part of a complete PFAS. Must be designed, installed, and used under the supervision of a qualified person and maintain a safety factor of at least two.

The ABC's of Personal Fall Arrest Systems: Anchorage, Body Harness, Connector

Connectors includes:

- **Lanyards** Device for connecting body harness to anchorage point.

There are different types of lanyards: shock-absorbing, self-retracting, synthetic rope, synthetic webbing.

Must be made from synthetic fibers and have a minimum breaking point of 5,000 lbs. per employee

Shock-absorbing lanyards should include deceleration devices to slow a fall and lower trauma to the body. Self-retracting life lines have a braking mechanism that is applied when the lineis extracted too fast.

Calculating Fall Distance

Calculating **Total Fall Distance (TFD)** is as necessary and important as using the proper body harness, lanyard, connectors and anchorage point. The TFD is the distance between the anchorage point and the closest obstruction.

Total Fall Distance can be found by using the following equation:
TFD = Length of Lanyard + Deceleration Distance + Height of Worker + Safety Factor

Calculating Fall Distance

Length of Lanyard (LL):

Lanyards can range from 18 inches to 6 feet.

Deceleration Distance (DD):

Should be 3.5 feet (*maximum allowed by OSHA*)

Height of Worker (HW):

Distance from the D-ring, located on the upper back on the body harness to the working level (generally about 4-5 feet).

Safety Factor (SF):

At least 2 feet should be used but 3 feet is suggested.

Controlled Access Zone

A **Controlled Access Zone** is a work area designated and clearly marked in which certain types of work (such as overhand bricklaying, leading edge work or other operations) may take place without the use of conventional fall protection systems to protect employees working in the zone.

- ✓ Only qualified personnel involved in the operation are allowed to enter the zone.
- ✓ **Controlled Access Zones** must be defined by a control line or by any other means that restrict access.

Controlled Access Zone

Control lines should

- Consist of
  - Ropes
  - Wires
  - Tapes
  - Or equivalent material

- Be flagged or clearly marked at not more than 6 foot intervals with high-visibility material.

- Have a minimum breaking strength of 200 lbs.

Other restrictions and rules apply. Your employer will provide you with necessary information if this type of protection is utilized by your company.

Warning Line System

Used mostly for work on roofs

Warns employees that they are approaching an unprotected roof side or edge.

Designates an area where roofing work may take place without the use of other fall protection systems.

Barrier is a warning line consisting of rope, wire, or chains placed at least 6 feet from leading edge and flagged at 6 foot intervals with high-visibility material.

Employees are not allowed between the roof edge and warning line unless performing roof work. Employees performing roofing work between the roof edges and warning line, must also be protected by guardrails, nets, PFAS or safety monitoring system

Safety Monitoring System

Safety Monitoring System: A safety system that utilizes a competent person to monitor the safety of other employees.

The safety monitor must:

- ✓ be competent to recognize fall hazards
- ✓ warn employees when a hazard appears, or if the employee is acting in an unsafe manner
- ✓ be on the same working level and within sight of employees being monitored
- ✓ be close enough to communicate orally with employees;
- ✓ not have other responsibilities that can take his/her attention from monitoring employees

Employees working in a controlled access zone must comply with the safety monitor.

Fall Protection Plan

This option is only available to employees engaged in:

- leading edge work
- precast concrete
- erection or residential construction work

where it is infeasible or creates a greater hazard to use conventional fall protection equipment.

Training

A training program is required for all employees who might be exposed to fall hazards. Employers are required to provide information and training to each employee in a manner that the employee understands.

Employees must be trained:

- ✓ to recognize fall hazards
- ✓ in procedures to follow to minimize hazards

Training

The training must be performed by a competent and/or qualified person who knows the:

- nature of fall hazards in the work area
- correct procedures for assembling, maintaining, disassembly and inspection of fall protection systems to be used
- use and operation of all fall protection devices including fall restraint devices, arresting devices, and any other device that minimizes fall hazards
- role of each employee when implementing the safety monitoring system; limitations of mechanical equipment during the performance of roof work on low sloped roofs
- correct procedures for handling and storage of equipment used for overhead protection
- roles of employees in fall protection plans and the standards regulated by OSHA.

Training

Employers must prepare current written certification to show record of each employee trained and should include:

- ✓ name or other identification of employee trained
- ✓ date(s) of training
- ✓ signature of the employer or the person performing the training

Employees should also be retrained when:

- ✓ changes to the workplace render previous training obsolete
- ✓ changes in the types of fall protection systems or equipment to be used changes
- ✓ inadequacies in an affected employee's knowledge or use of fall protection systems or equipment indicate the employee has not retained the required understanding or skill.

Conclusion

Falls are a major safety issue and using the right protection is necessary to ensure your safety.

- Fall protection must be used properly.
- Fall protection must be used when working on any surfaces more than 4 feet above a lower level in general industry and 6 feet in construction industry.
- Remember the ABCs of Personal Fall Arrest Systems: Anchorage, Body Harness and Connectors and how to use all components properly.
    - Know the Total Fall Distance when using PFASs.
        - Take training seriously.