

Fall Protection Hazard Awareness Guide

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Identifying Common Fall Hazards

Key issues to be discussed within this section include:

1. Fall hazards associated with scaffolding.
2. Fall hazards associated with ladders.
3. Fall hazards associated with roofs, including skylights.
4. Falls from one level to the next working surface to ground.
5. Fall hazards during steel erection.
6. Fall hazards during concrete work (including formwork, precast and overhand brick laying).
7. Other work surfaces (slips, trips, falls, picks, lifts, platforms and housekeeping).

The following are lists of areas that contractors can focus upon which can contribute to falls from each area. Effectively controlling and/or eliminating these deficiencies should reduce the occurrences of these falls.

Scaffolding

An average of 89 workers are killed from falling from scaffolds each year (BLS). The majority of the workers injured in scaffold accidents attribute the accident either to the planking or support giving way, or to the employee slipping or being struck by a falling object. One of the most frequently cited OSHA violations is lack of fall protection on scaffolds. When conducting job hazard analysis on scaffolds, consider these questions:

1. Is a competent person present during the erection, alteration, movement and disassembly of the scaffold system?
2. Are all scaffold systems inspected on a regular basis?
3. Are scaffold systems erected in accordance with manufacturers recommendations?
4. Is equipment being used for ways it was not intended?
5. Is the scaffold base erected on a firm foundation, or adequate sill/pad?
6. Is the scaffold system plumb, level, rigid and square?
7. Are all cross/support braces properly installed?
8. Are all scaffold components compatible with each other?
9. Are all pins, clips and locking mechanisms installed and operating correctly?

10. If required, is the scaffold system secured/tied to the wall or structure at the proper intervals? (30' horizontal/24' vertical)
11. Are outriggers installed on freestanding scaffolds, which exceed 4 times their minimum base width vertically (in some state plans it is 3 times the base width), and are they locked into place?
12. Is a safe means of access provided to the working level via a ladder, ramp or stairway?
13. Are guardrails or other forms of fall protection provided when employees are exposed to a fall in excess of the Subpart "L" standard?
14. Is the working surface properly planked/decked with scaffold grade material?
15. Is the working surface, guardrails, and access/egress maintained in a clean and non-slippery condition to avoid slip hazards?
16. Is the scaffold system overloaded?
17. For suspended scaffolds, are the pulley, motor, anchor and fall protection systems in place and operating correctly?
18. Is rigging correct on the suspended scaffold system?
19. Are the tiebacks sized, installed, anchored and inspected to ensure their effectiveness?
20. Are all inspection requirements recommended by the manufacturer being performed?
21. Are heavy loads placed over bearing portions of the scaffold assembly, and not in the center of the work surface?
22. Are all defective scaffold components tagged and immediately removed from service to be repaired or destroyed?
23. Are employees trained on scaffold use, erection and inspection?

Scaffold Hazard Identification



Picture courtesy UBC

1926.451(f) – Scaffold Use

(3) Scaffolds and scaffold components shall be inspected for visible defects by a competent person before each work shift, and after any occurrence which could affect a scaffold's structural integrity.

(4) Any part of a scaffold damaged or weakened such that its strength is less than that required by paragraph (a) of 1926.451 shall be immediately repaired or replaced, braced to meet those provisions, or removed from service until repaired.

1926.451(c) – Criteria for Supported Scaffolds

(2) Supported scaffold poles, legs, posts, frames, and uprights shall bear on **base plates** and mud sills or other adequate firm foundation.



1926.451(c) – Criteria for Supported Scaffolds

(2)(ii) Unstable objects shall not be used to support scaffolds or platform units.

Picture courtesy UBC

1926.451(c) – Criteria for Supported Scaffolds

(2)(iv) Front-end loaders and similar pieces of equipment shall not be used to support scaffold platforms unless they have been specifically designed by the manufacturer for such use.

OSHA Standard Interpretation, 09/30/1999 – Forklifts in construction: elevating personnel and operator training.

“Powered industrial trucks, which include forklifts, as well as rough terrain forklifts, are similar pieces of equipment to forklifts and front end loaders in this context. Therefore, they fall within the requirements of 1926.451(c)(2)(iv).”





Picture courtesy UBC

1926.451(c) – Criteria for Supported Scaffolds

(3) Supported scaffold poles, legs, posts, frames, and uprights shall be plumb and braced to prevent swaying and displacement.

1926.451(e) – Scaffold Access

(1) When scaffold platforms are more than 2 feet above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stair towers, stairway-type ladders, ramps, walkways, integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist, or similar surface shall be used. **Crossbraces shall not be used as a means of access.**



Picture courtesy UBC



Picture courtesy UBC

1926.451(g) – Scaffold Fall Protection

(4)(i) Guardrail systems shall be installed along all open sides and **ends** of platforms. Guardrail systems shall be installed before the scaffold is released for use by employees other than erection/dismantling crews.

1926.451(b) – Scaffold Platform Construction

(1) Each platform on all working levels of scaffolds shall be fully planked or decked between the front uprights and the guardrail supports as follows:

(i) Each platform unit shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than 1 inch wide, except where the employer can demonstrate that a wider space is necessary.



Picture courtesy UBC



Picture courtesy UBC

1926.451(b) – Scaffold Platform Construction

(3) Except as provided in paragraphs (b)(3)(i) and (ii) of this section, the front edge of all platforms shall not be more than 14 inches from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used in accordance with paragraph (g) of this section to protect employees from falling.

(4) Each end of a platform, unless cleated or otherwise restrained by hooks or equivalent means, shall extend over the centerline of its support at least 6 inches.

1926.451(f) – Scaffold Use

(15) Ladders shall not be used on scaffolds to increase the working level height of employees, except on large area scaffolds where employers have satisfied the criteria listed in 1926.451(f)(15)(i)-(iv).



Picture courtesy UBC



Picture courtesy UBC

1926.451(f) – Scaffold Use

(12) Work on or from scaffolds is prohibited during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and those employees are protected by a personal fall arrest system or wind screens. Wind screens shall not be used unless the scaffold is secured against the anticipated wind forces imposed.

Ladders

Falls from ladders account for approximately 100 fatalities each year (BLS). Ladders can be found on every jobsite and are used by all trades. Some of the most frequently cited serious ladder violations are; not securing a portable ladder or having it extended 3 feet above the upper landing before workers use it to reach an upper level, not providing a training program for workers on the proper construction, inspection, maintenance, care, use, and limitations of ladders, and not marking or tagging a defective ladder so that it would not be used before it has been repaired. The requirements for ladders can be found in Subpart X of the Construction Safety and Health Standards. When analyzing work areas for proper ladder use, consider the following questions:

1. Is the correct ladder for the job being used?
2. Are ladders inspected before use?
3. Are metal ladders prohibited near electrical sources?
4. Are stepladders being placed against the wall, in a closed position, which can cause them to slide out from underneath a worker?
5. Are extension ladders secured at the top, and the bottom if possible?
6. Is the extension ladder installed at the correct angle (the 1 to 4 rule)?
7. Do side rails extend 3' above the working surface?
8. Are ladders being overloaded?
9. Is the extension ladder overextended?
10. Are materials being hoisted by a line, and not by the individual climbing the ladder?
11. Is the three-point-contact rule being followed? (i.e. both feet and one hand or both hands and one foot)
12. Never allow two ladders to be tied together!
13. Are all damaged ladders immediately tagged and repaired or destroyed?
14. Are ladder feet placed on a firm foundation?
15. Are proper climbing/working procedures being followed?
16. Never allow an individual to “bounce” or “walk” a stepladder to move it!
17. Are stepladders used in the fully open position only?
18. Are individuals working on the correct side of a stepladder?
19. Are all hinges, spreaders, locks and feet on ladders in serviceable condition?
20. Never allow any ladder to be used in the horizontal position as a scaffold plank or work platform!
21. Are ladders with broken or missing rungs or split side rails, tagged and taken out of service or destroyed?
22. Are access/egress areas around the top and bottom of the ladder kept clear?
23. Are all ladders inspected regularly?
24. Are filler blocks placed between the cleats of job made ladders?
25. Where simultaneous two-way traffic can be expected, is there a double cleat ladder installed?
26. Does the design and assembly of the job built ladder meet the requirements of ANSI Standard A14.4?

Ladder Hazard identification



1926.1053(a) – Ladders, General

(8) A metal spreader or locking device shall be provided on each stepladder to hold the front and back sections in an open position when the ladder is being used.



1926.1053(a) – Ladders, General

(7) Ladders shall not be tied or fastened together to provide longer sections unless they are specifically designed for such use.



1926.1053(b) – Ladder Use

(1) When portable ladders are used for access to an upper landing surface, the ladder side rails shall extend at least 3 feet (.9 m) above the upper landing surface to which the ladder is used to gain access; or, when such an extension is not possible because of the ladder's length, then the ladder shall be secured at its top to a rigid support that will not deflect, and a grasping device, such as a grabrail, shall be provided to assist employees in mounting and dismounting the ladder. In no case shall the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.



1926.1053(b) – Ladder Use

(6) Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.



1926.1053(b) – Ladders Use

(13) The top step of a stepladder shall not be used as a step.

(14) Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.



Manufacturers are required to display this marking on self-supporting stepladders (ANSI Standard A14.2).



1926.1053(b) – Ladder Use

(15) Ladders shall be inspected by a competent person for visible defects on a periodic basis and after any occurrence that could affect their safe use.

(16) Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps, broken or split rails, corroded components, or other faulty or defective components, shall either be immediately marked in a manner that readily identifies them as defective, or be tagged with “Do Not Use” or similar language, and shall be withdrawn from service until repaired.



1926.1053(b) – Ladder Use

(21) Each employee shall use at least one hand to grasp the ladder when progressing up and/or down the ladder.

(22) An employee shall not carry any object or load that could cause the employee to lose balance and fall.

Roofing Including Skylights

Falls from roofs are responsible for approximately 120 deaths each year in the construction industry. Roofing, siding, and sheet metal contractors have the highest incident rate of nonfatal occupational injuries resulting from a fall to a lower level and involving days away from work at 110.4 for every 10,000 full-time workers. When conducting a job hazard analysis on roofing work, consider the following questions:

1. Are all skylight/roof openings protected by covers or guardrails?

Note: Most glass or plastic covers on skylights will not meet the structural requirements of a cover, check with the manufacturer. To be safe the installation of a proper cover or guardrail is recommended.

2. Is there a warning line in place?
3. Is there a safety monitor on the roof in visual/verbal range of employees?
4. Is all mechanical equipment kept inside the warning line?
5. Is the hoist area protected with a guardrail system?
6. Are employees below the hoist area protected from falling objects/material?
7. Are guardrails, safety nets or personal fall arrest systems in use on roofs that exceed a 4/12 pitch?
8. Are employees working on surfaces, which are hazardous because of poor footing due to frost, ice, or mildew?
9. Are employees working in hazardous conditions such as high winds, poor visibility or inclement weather?
10. Is there a safe/secure access to the roof via stairs or a secured ladder?

Roof Hazard Identification

1926.501(b) – Unprotected Sides and Edges

(4) Each employee on a waling/working surface shall be protected from falling through holes (including skylights) more than 6 feet above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.

1926.502(i) – Hole Covers

(3) All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.





1926.502(i) – Hole Covers

(2) All hole covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

Falls From a Floor (one level to the next)

1. Are all holes covered with structurally appropriate, marked and secured covers?
2. Are all exposed edges protected with a guardrail system?
3. Where guardrails are not installed are personal fall arrest, safety nets or fall restraining systems in place and being used?
4. Are windows or wall openings, where the lower sill is below 39 inches from the walking/working surface, protected with a guardrail system?
5. Are removable sections of guardrails for incoming materials replaced and structurally sound after materials are loaded?
6. When guardrails are removed for incoming material, are alternate fall protection measures being used (i.e., personal fall arrest, fall restraint or safety nets)?
7. Are toe boards installed to protect employees below from falling objects?

Falls From a Floor Hazard Identification

1926.501(b)(4) – Holes

(i) Each employee on walking/working surfaces shall be protected from falling through holes more than 6 feet above lower levels...

(ii) Each employee on a walking/working surface shall be protected from tripping in or stepping into or through holes by covers.

(iii) Each employee on a walking/working surface shall be protected from objects falling through holes by covers.



Removable sections of guardrails for incoming materials must be replaced and structurally sound after materials are loaded.

1926.502(b) – Guardrail Systems

(3) Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds applied within 2 inches of top edge, in any outward or downward direction, at any point along the top edge.

Steel Erection

1. Are the workers performing the steel erection trained and qualified for this task?
2. Can fall protection systems be installed on the ground before the steel is erected (i.e., horizontal life lines, retractable lanyards or safety nets)?
3. Is the erection process so designed as to minimize the possibility that the connectors will have to move suddenly to avoid any unwanted contact with incoming members?
4. Can the erection/connecting process be completed from scissor or boom lifts, thus eliminating unwanted fall exposures?
5. Can sections of the structure be assembled on the ground and lifted into place as a unit, which will minimize the fall exposures?
6. Are tag lines being used to prevent incoming members from inadvertently swinging and creating a hazard to the connectors?
7. Are temporary connections adequate to support the intended load?

Concrete

1. Are all workers performing the erection process trained and qualified for the task?
2. Can fall protection systems be installed on the ground before the members are erected into place (i.e., life lines, safety nets and retractable lanyards)?
3. Is the erection process so designed as to minimize the possibility that the connectors will have to move suddenly to avoid any unwanted contact within coming members?
4. Can the erection/connecting process be completed from scissor or boom lifts, eliminating unwanted fall exposures?
5. Are positioning systems being used on formwork?
6. Are guardrails installed on formwork, where appropriate?
7. Is the appropriate controlled access zone established for overhand brick laying and/or precast operations?
8. Is formwork and shoring adequate to support the intended loads?
9. Are all impalement hazards, such as rebar, covered, protected or bent over to eliminate the impalement hazard?

Concrete Hazard Identification



1926.501(b)(12) – Precast Concrete Erection

Each employee engaged in the erection of precast concrete members and related operations such as grouting of precast concrete members, who is 6 feet or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure.

Other Work Surfaces

1. Is the walking/working surface inspected and structurally capable of supporting the workers and equipment in the area?
2. Is the walking/working surface kept clean of slip hazards such as ice, oils, mold/mildew or any other material, which hinders good traction?
3. Are all picks, platforms or temporary work surfaces secure and provided with fall protection (i.e., guardrails, safety nets, personal fall arrest systems or fall restraint)?
4. Are all scissor/boom lifts inspected daily and operated in accordance with the manufacturers recommendations?
5. Are all gates/chains being used and secured on scissor/boom lifts?
6. Is the site being regularly cleaned up to avoid slip/trip hazards?
7. Are there guardrails on ramps or runways where the fall exposure exceeds 6 feet?
8. Are stairways in good condition with appropriate railing systems installed?
9. Are hollow pan stair treads filled in with solid material to eliminate tripping?
10. Are excavations provided with fall protection where required, by the use of guardrails, fences or barricades?

Other Work Surface Hazard Identification

1926.453(b)(2) – Aerial Lifts, Specific Requirements for Extensible and articulating Boom Platforms

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(v) A full body harness shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.





1926.25 – Housekeeping

(a) During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails, and all other debris, shall be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures.

Analyzing the Work Area

Key concepts to be discussed within this section include:

1. Review blueprints before work begins.
2. Anticipate upcoming fall hazards as work progresses.
3. Review for Current Hazards on Site.
4. Pre-planning for fall protection checklist.
5. Fall protection options guide.

Review Blueprints Before Work Begins

One of the first steps in analyzing the work area should be the review of blueprints before work ever begins on the site. By addressing fall hazards at this stage, the contractor will be better prepared to provide fall protection to the employees. The following are suggestions to assist contractors in identifying those areas to address.

1. At any stage of the job will there be open sided floors where a fall hazard exists, if so, here are some options:
 - a. Can guardrails be installed?
 - b. Can safety nets be installed?
 - c. If guardrails or nets cannot be installed, will personal fall arrest or restraining systems be employed?
2. Will employees be exposed to floor, or roof openings? If so, will these openings be covered or have guardrails installed around them to protect employees?
3. Is there the possibility of employees being struck by falling objects? If so, will protection be provided?
4. Are scissor lifts required? And is there a system in place to ensure proper inspection and maintenance of these systems?
5. Are roofing operations addressed ahead of time in order to provide fall protection?

6. Is there a fall protection system in place for the installation of exterior sheeting such as:
 - a. Vertical lifelines.
 - b. Other work methods such as installation from articulating boom lifts.
7. Are there structural members adequate to meet the requirements for anchor points with personal fall arrest systems?
8. Are housekeeping measures addressed to avoid possible slip/trip hazards?
9. Additionally, unique fall hazards should be addressed before any exposure.

Anticipate Upcoming Fall Hazards as Work Progresses

The safety director or site fall protection competent person never wants to be caught off guard with surprise hazards or exposures. To avoid, what is known as putting out fires, these individuals must always be prepared. One method is to review the job for the fall hazards that will be present in the future. The following should assist in addressing this issue:

1. Review the blueprints for upcoming processes/hazards.
2. Discuss the work process with project manager, superintendents, architect and workers to identify where new hazards may develop.
3. Ask foreman for assistance in recognizing what hazards may develop in the future.

Review for Current Hazards on Site

If the job has already progressed beyond the point where review of the blueprints will not be effective, then the site must be reviewed for current hazards. The review for current hazards will allow the fall protection competent person to address the fall exposures in order to eliminate or minimize the hazard.

Note: For a complete checklist to review the site for fall hazards please refer to section, "Identifying Common Fall Hazards."

Pre-Planning Checklist

The following is a checklist to assist contractors in their efforts to pre-plan for fall prevention/protection and can be used at any stage of the construction process. It is preferable that this checklist be used before any designing or work ever begins to be most effective in eliminating falls and related injuries.

1. Begin the process by identifying those areas where exposures to falls will or already exist such as:
 - Scaffolds
 - Ladders
 - Roofs (low/steep sloped) and roof openings including skylights
 - Open sided floors and floor openings
 - Steel erection
 - Aerial lift platforms
 - Permanent and temporary working platforms
 - Excavations
 - Leading edges
 - Overhand bricklaying
 - Hoist areas
 - Ramps, runways and walkways
 - Wall openings
 - Stairways
 - Working over dangerous equipment
 - Potential for falling objects
 - Formwork
 - Installation of exterior sheeting/siding
 - Precast and lift slab erection
 - Housekeeping concerns
2. Do you or the contractor have a written fall protection program?
3. If work has begun, or is in progress, have you surveyed the jobsite to identify where/what the fall hazards are on the job?
4. Review the blueprints for fall hazards that are present and likely to develop into a hazard?
5. Is it possible to provide or install fall prevention measures before there's an exposure?
Some examples include:
 - a. Install guardrails before allowing workers on the floor.
 - b. Install safety nets to structural steel before members are lifted into place.
 - c. Don't cut floor openings until prepared to fill with specified object.
 - d. Sheet exterior walls before standing on upper levels.
 - e. Attach a retractable lanyard to the top of a column before standing the column.
6. If possible, specify fall prevention/protection measures when ordering materials, some examples include:
 - a. Order stair systems, ramps or walkways with guardrails included.

- b. Have the architect locate, specify, design and have installed adequate anchor points for personal fall arrest systems.
 - c. Order structural steel members with holes adequate to attach snap hooks to for personal fall arrest.
- 7. Is there a competent person on site in relation to fall protection?
- 8. Does the competent person on site understand the fall protection standard, trained to select the proper fall protection measures/systems, and understand the differences between the following systems and their use:
 - a. Fall Prevention.
 - b. Fall Protection.
 - c. Active fall protection.
 - d. Passive fall protection.
- 9. Will there be a need for a qualified person? For example, in the development of a job built horizontal lifeline system.
- 10. Are subcontractors selected on their ability to safely complete the task with a proven track record of providing effective fall protection?
- 11. Were pre-job and pre-bid meetings held which clearly stated the requirements of the fall protection measures expected from all contractors on the site?
- 12. Is there an adequate fall protection-training program in place to train employees in the fall protection measures/systems in place on the site?
- 13. For personal fall arrest systems are anchor points identified and capable of supporting 5,000 pounds per worker or two times the intended impact load (determined by a qualified person)? Additionally, have swing hazards been addressed in the anchor point location?
- 14. Has an enforcement policy been established, and if so, is it communicated, accepted and enforced?
- 15. Have rescue methods and procedures been addressed in the event of a fall?
- 16. Are employees selected and trained to work at heights safely?
- 17. Have other work methods been proposed or implemented such as:
 - a. Connecting steel or concrete from articulating boom lifts.
 - b. Assembling structures on the ground and lifting them into place, minimizing exposure.
 - c. Installing safety nets or horizontal lifelines on the ground before workers are exposed.

- d. Installing clamp-on guardrails around roof edge instead of using a warning line system.
18. Have free fall considerations been addressed including:
- a. Total free fall clearances are adequate for system in use.
 - b. Employees will not strike lower objects in the event of a fall.
 - c. Employees will not be exposed to forces greater than 1,800 foot pounds in a full body harness.

Fall Protection Options Guide

OSHA regulations require protection when workers are exposed to falls of 6 feet or more. The regulations define the specific hazards and outline acceptable ways of providing protection for these hazards. Some of the exposures discussed within this manual are listed below with a list of fall protection systems available to contractors.

Employees Working Over Dangerous Equipment (regardless of fall distance)

- Guardrail system
- Safety net system
- Personal fall arrest system

Excavations

- Guardrail system
- Fences
- Barricades

Formwork and Reinforcing Steel

- Safety net system
- Personal fall arrest system
- Positioning system

Hoist Areas

- Guardrail system
- Safety net system
- Personal fall arrest system
- Fall restraint system

Holes

- Covers
- Guardrail system
- Safety net system
- Personal fall arrest system
- Fall restraint system

Leading Edges

- Guardrail system
- Safety net system
- Personal fall arrest systems
- Fall restraint system
- Fall protection plan

Overhand Brick Laying

- Guardrail system
- Safety net system
- Personal fall arrest system
- ***Controlled access zone***

Precast Concrete Erection

- Guardrail system
- Safety net system
- Personal fall arrest system
- Fall protection plan

Floor/Roof Openings

- Hole covers
- Guardrail system
- Personal fall arrest system
- Fall restraint system

Roofing Work (low sloped roof)

- Guardrail system
- Safety net system
- Personal fall arrest system
- Safety monitor system (if roof is 50 feet or less in width)
- Warning line/safety monitor system
- Warning line/guardrail system
- Warning line/safety net system
- Warning line/personal fall arrest system
- Warning line/fall restraint system

Roofing Work (steep sloped roofs)

- Guardrail system
- Safety net system
- Personal fall arrest system

Unprotected Sides and Edges

- Guardrail systems
- Safety net systems
- Personal fall arrest systems
- Fall restraint systems

Ramps, Runways and other Walkways

- Guardrail system
- Personal fall arrest system
- Safety net system

Wall Openings

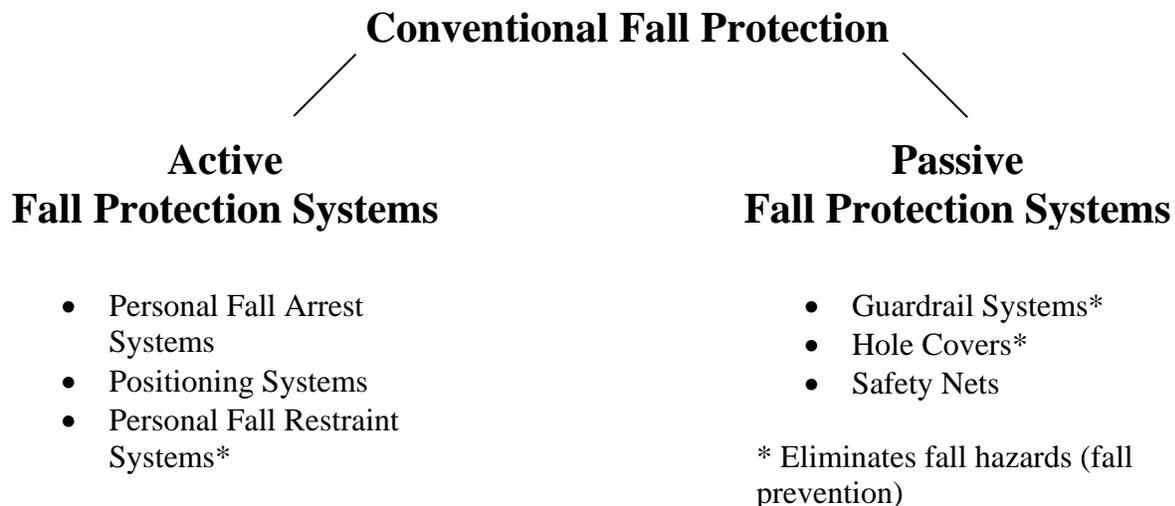
- Guardrail system
- Safety net system
- Personal fall arrest system
- Fall restraint system

Conventional Fall Protection Systems

Key systems to be discussed within this section include:

1. Guardrail Systems
2. Hole Covers
3. Safety Nets
4. Personal Fall Arrest Systems
5. Positioning Systems
6. Personal Fall Restraint Systems

Conventional fall protection systems could be broken down into two categories, active fall protection systems and passive fall protective systems. The difference between the two systems is the amount of worker involvement in determining the proper installation and use of the systems. A consideration when choosing conventional fall protection is whether the fall hazard is eliminated (fall prevention) or controlled (fall protection). A fall prevention system that limits worker involvement and eliminates the fall hazard, for example guardrails, is the preferred method for providing worker protection against falls.



Guardrail Systems

Guardrails are one of the most common forms of fall protection seen on the construction site. The OSHA standard requires that guarding or some form of fall protection must be provided when an employee is exposed to a fall of 6 feet or more. The following areas lend themselves to the installation of guardrail systems for fall prevention.

1. Along the edge of all open sided floors or edges where a fall exposure exists.
2. On work platforms where a fall exposure exists.
3. On stair systems.
4. Around floor and roof openings.
5. Around holes too large to place covers over.
6. Around the exterior of a roof during roofing work.
7. On articulating/elevating work platforms.
8. Near window openings where the sill is lower than 39 inches.
9. In an area/edge where a possible fall would allow an employee to strike dangerous equipment or material, regardless of the fall distance.
10. On access ways, ramps or catwalks where there is a fall exposure.
11. Parapets less than 39" in height.

General Requirements of Guardrail Systems

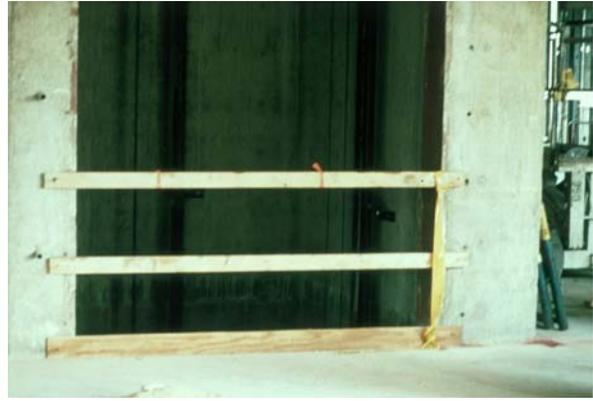
- The top edge of the guardrail system shall be 42 inches, ± 3 inches, above the walking/working surface.
- Midrails must be installed between the top edge of the guardrail system and the walking/working surface.
- The guardrail system must be capable of withstanding a 200-pound force applied to the top rail in an outward or downward direction.
- When the 200-pound force is applied the top rail cannot deflect to a height less than 39 inches above the walking/working surface.
- All midrails, screens, mesh, intermediate vertical members or panels must be able to withstand a 150-pound force in a downward or outward direction.
- Where employees will be using stilts, the height of the top rail must be increased a height equal to the height



Where parapet walls or windowsills do not extend at least 39 inches above the walking/working surface, precautions must be taken to ensure proper guardrails are in place.

of the stilts which in effect serve as the walking/working surface.

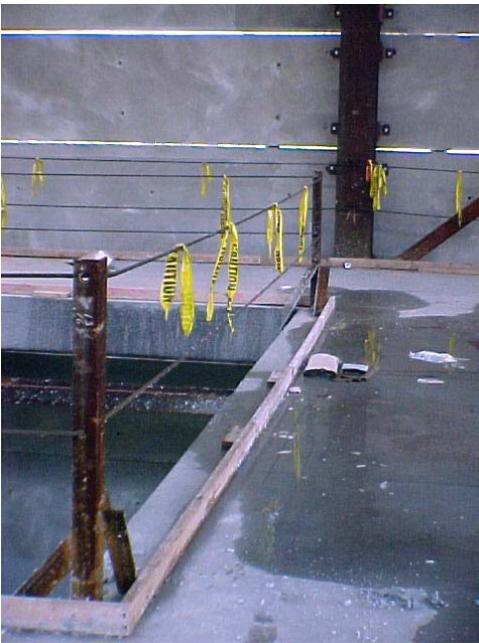
- All guardrail systems must be smooth surfaced.
- Steel or plastic banding can NEVER be used in a railing system.
- Avoid using manila, plastic or synthetic rope because they must be inspected often and may deteriorate rapidly.



Elevator shafts and other similar wall openings must be protected against fall hazards.

Wire Rope Guardrails

1. Must be made from 1/4 inch diameter cable or larger.
2. Must be flagged every 6 feet with a high visibility material like caution or surveyors tape.



Wire rope guardrails must be flagged every 6 feet for visibility.



Wood guardrails must be made of at least 2"x4"s with spans not greater than 8 feet on center.

Appendix B to Subpart M - Guardrail systems

The standard requires guardrail systems and components to be designed and built to meet the requirements of 1926.502 (b) (3), (4) and (5). An employer may use these guidelines as a starting point for designing guardrail systems. However, the guidelines do not provide all the information necessary to build a complete system, and the employer is still responsible for designing and assembling these components in such a way that the completed system will meet the requirements of the above stated references.

1. **For Wood Railings:** Wood components shall be a minimum 1500 lb. ft./in² fiber (stress grade) construction grade lumber; the posts shall be at least 2" x 4"s no more than 8 feet on center; the top rail shall be at least 2" x 4" material, and the midrails shall be at least 1" x 6" material.
2. **For Pipe Railings:** Posts, top rails and midrails shall be at least one and one half (1.5) inch nominal diameter schedule 40 pipe, with posts spaced no more than 8 feet on centers.
3. **For Structural Steel Railings:** Posts, top rails and midrails shall be at least 2-inch by 2-inch by 3/8-inch angle, with posts spaced not more than 8 feet on center.

Note: For wire rope guardrails there is no requirement that terminal supports are maintained every 8 feet on center, but when tested in the center with the 200 pound force the toprail must never deflect below 39 inches from walking/working surface.



Walkways over excavations that are 6 feet or more in depth must be guarded to prevent falls.

Hole Covers

Hole covers are another method an employer may use to protect against falls. According to the OSHA definition, a hole is any opening measuring 2 inches or more in its least dimension in a floor, roof or walking surface. The following guidelines should assist in the placement of hole covers.



1. Place covers over all holes on the site, for larger holes guardrail systems are an option.
2. Construct the covers to support two (2) times the weight that will cross over them. This includes employees, equipment, tools and all construction vehicles, such as scissor lifts.
3. If plywood is used as a hole cover it must be at least 3/4 inch thick.
4. All covers must be secured. Cleats, wire, nails or any other method, which will not allow the cover to be displaced, can do this.
5. After the cover is placed, write the word hole or cover on it for identification. This can be easily done with a can of spray paint.
6. If the cover is too small to write "hole" on it, then they must be color coded for identification and employees must be trained to recognize what the color is identifying.

General Requirements for Hole Covers

1. When the cover is placed in a roadway, or area where any vehicles may pass, the cover must be designed to support two times the maximum axle load of the largest vehicle expected to cross.
2. In all other areas, the covers shall be designed to support twice the weight of employees, equipment, and materials that may be imposed on the cover at one time.
3. All covers must be secured when installed so that wind, equipment or employees will not displace them. Cleating, wiring them down or nailing to secure the covers can do this.
4. All covers must be color-coded or have the word "hole" or "cover" written on them. This is to identify them to employees so they are not removed. If a color-coding scheme is used, then training as to what the color means must be provided to all those exposed to the fall hazard.

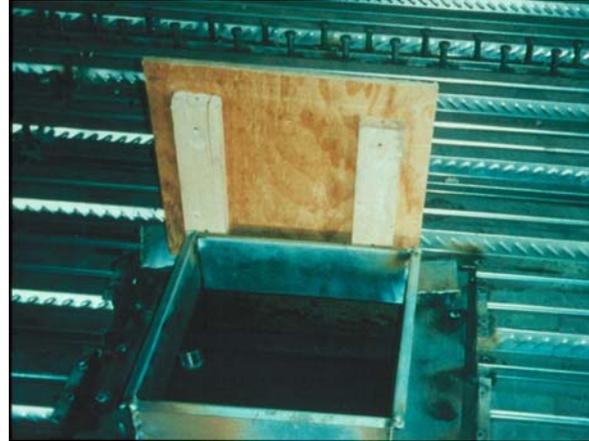


Hole covers must be color-coded or marked "Hole" or "Cover" so as they can be identified as being hole covers.

5. If plywood is used to cover holes, it should be at least 3/4 inch thick.
6. Install the covers so as to eliminate any tripping hazard.



Hole covers must be designed to support two times the maximum axle load of the largest vehicle expected to cross over it.



Cleats may be used to prevent displacement of hole covers. If uplift can occur, wiring or nailing them down may be necessary.

Safety Net Systems

The installation of a safety net does not keep an employee from falling; rather they catch the employee after the fall. They are though, similar to guardrails and covers in the respect that these three systems are recognized as passive fall protection. In other words, they are always in place to provide fall protection. Safety nets are commonly installed in the following ways.

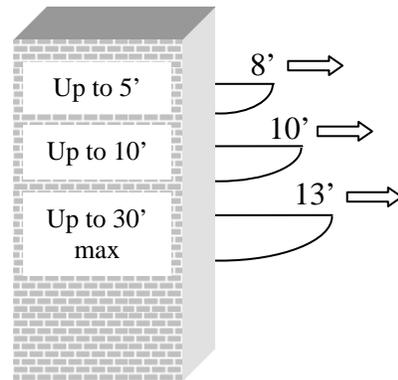
1. Safety nets are used during steel erection. To provide the best protection, the erector should assemble as much of the structure on the ground. Once assembled, the safety nets are installed before the section is lifted into place and secured.
2. During bridgework. Nets can be installed in the same manner as above, or in the event of reconditioning work the nets should be installed from boom lifts, man baskets or employees utilizing personal fall arrest systems.
3. During demolition or maintenance work. Safety nets can be designed to provide personal fall protection, and to collect falling debris.
4. In any event, the installation of safety nets must be done by individuals protected from the fall hazards they are exposed to during the installation.
5. Safety nets are also acceptable means of fall protection for holes, open sided floors, catch platforms and steel/concrete erection.
6. Make certain the safety net is designed for this purpose and is serviceable.

General Requirements for Safety Nets

Safety nets used for fall protection are specifically designed for this purpose and must meet the following requirements:

1. They must be installed as close as possible under the walking/working surface, but in no case will an employee be exposed to a fall of greater than 30 feet.
2. Safety nets must extend outward from the outer most edge of the work surface in accordance with the requirements listed in 1926.502 (c) (2).
3. The nets must be installed in a manner that should an individual fall, they will not strike any object below the net.
4. Safety nets, and their installation, must be tested with a 400 pound bag of sand as specified in 1926.502 (c) (4) (i) of the standard.
5. When the employer can demonstrate that it is unreasonable to perform the drop test he shall certify the net and net installation following 1926.502 (c) (4) (ii) of the standard.
6. Defective safety nets will not be used.
7. Safety nets must be inspected weekly for wear, damage and any deterioration.
8. Nets must be inspected after any occurrence which could effect its integrity, such as a steel member falling into the net.
9. Any materials, scrap, tools or equipment that falls into the net must be removed as soon as possible but no later than the end of the work shift.
10. The safety net design and connections shall comply with 1926.502 (c) (7), (8) and (9).

Safety Net Extension (On the exterior of the structure)



Nets must be installed in a manner that should an individual fall, they will not strike any object below the net (picture courtesy of DBI/Sala).



Any materials, scrap, tools or equipment that falls into the net must be removed as soon as possible but no later than the end of the work shift.



Each net shall be permanently labeled with the following information:

1. Name of Manufacturer
2. Identification of net material
3. Date of manufacture
4. Date of prototype test
5. Name of testing agency
6. Serial number

Personal Fall Arrest Systems/Equipment

The personal fall arrest systems used in construction should be used as a last resort. The contractor should focus on fall prevention methods first such as guardrails or hole covers. If after all pre-planning for fall prevention still leaves a fall exposure then a personal fall arrest system could be implemented. The following are some key concerns when implementing a personal fall arrest option.

1. Only a full body harness with a retractable or shock-absorbing lanyard and locking snap hook is used.
2. Anchor points for tying off needs to be structurally sound.
3. Employees are constantly tied-off when in the area of a fall hazard.
4. All personal fall arrest equipment needs to be inspected according to the manufacturers directions.
5. The system needs to be installed/designed to limit the free fall to 6 feet.
6. Fall forces must be within acceptable limits.
7. Any additional hazards that could arise in the event of a fall needs to be eliminated.
8. A rescue plan needs to be in place in the event of a fall.
9. Employees need to be trained in the use of the personal fall arrest systems.

General Requirements for Personal Fall Arrest Systems

Personal fall arrest systems have been used in construction for a number of years. Some key points to remember include the following:

1. Full body harnesses with the D-ring positioned in the middle of the back must be used.
2. Snaphooks must be the double locking type.

Note: The use of body belts in a positioning device system is acceptable and is regulated under positioning systems.

1. Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.
2. Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
3. D-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds.
4. D-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent deformation.
5. Only locking type snaphooks shall be used.



Snaphooks must be double locking and only attached to approved anchorage points (picture courtesy DBI/Sala).



Full body harnesses with D-rings positioned in the middle of the back must be used for personal fall arrest.

6. Unless the snaphook is designed for the following connections, snaphooks shall not be engaged:
- a) Directly to webbing, rope or wire rope.
 - b) To each other.
 - c) To a D-ring to which another snaphook or other connector is attached.
 - d) To a horizontal lifeline.
 - e) To any object in which its shape or dimension is incompatible in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.



Unless approved by the manufacturer, snaphooks must not be attached to each other. Also, body belts are not used for personal fall arrest.



Unless approved by the manufacturer, snaphooks must not be tied back onto its own lanyard.



An example of an approved method to tie back a snaphook onto its own lanyard.

7. On suspended scaffolds or similar work platforms with horizontal lifelines that may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.
8. Horizontal lifelines shall be 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.
9. Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds.
10. When vertical lifelines are used, each employee shall be attached to a separate lifeline. During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with guardrails; the strength of the lifeline is 10,000 pounds [5,000 pounds per employee attached]; and all other criteria specified in this paragraph for lifelines have been met.
11. Lifelines shall be protected against being cut or abraded.
12. Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
13. Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.



Lifelines must be designed to support 5,000 pounds per worker attached and protected against being cut or abraded (picture courtesy DBI/Sala).



Talon™ by DBI/Sala

Mini Lite™ by Miller

Self-retracting lanyards come in variety of lengths and styles. They are lightweight and allow worker mobility while being protected from falls.

14. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.
15. Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as follows:
 - a) As part of a complete personal fall arrest system which maintains a safety factor of at least two.
 - b) Under the supervision of a qualified person.
16. Personal fall arrest systems, when stopping a fall, shall:
 - a) Limit maximum arresting force on an employee to 1,800 pounds when used with a full body harness.
 - b) Be rigged such that an employee can neither free fall more than 6 feet nor contact any lower level.
 - c) Bring an employee to a complete stop and limit maximum deceleration distance to 3.5 feet.
 - d) 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.



Shock-absorbing packs and lanyards will limit the fall forces subjected to someone who has fallen. They also increase the fall distance, so consideration must be taken to ensure proper clearance is provided.

Note: If the personal fall arrest system meets the criteria and protocols contained in Appendix C to subpart M, and if the system is being used by an employee having a combined person and tool weight of less than 310 pounds, the system will be considered to be in compliance. If the system is used by an employee having a combined tool and body weight of 310 pounds or more, then the employer must appropriately modify the criteria and protocols of the Appendix to provide proper protection for such heavier weights, or the system will not be deemed to be in compliance.

17. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level.
18. Personal fall arrest systems and components shall be used only for employee protection and not to hoist materials.
19. Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.
20. The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.
21. Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.
22. Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other subparts.



1926.502(d)(8) Horizontal lifelines shall be 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.

Positioning Systems

Positioning systems in use are most commonly seen during formwork and tying of rebar. The following are key issues to address when allowed to use a positioning system.

1. Positioning systems must limit free fall to 2 feet.
2. Ensure that employees are trained in the use of positioning systems.
3. Positioning systems must be inspected according to manufacturers directions.
4. Anchor points must be capable of supporting 3,000 pounds.



Positioning systems limits the free fall distance to less than 2 feet.

General Requirements for Positioning Systems

Positioning device systems and their use shall conform to the following provisions:

1. Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet.
2. Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater.
3. Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.
4. Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.
5. Connecting assemblies shall have a minimum tensile strength of 5,000 pounds.
6. D-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent deformation.
7. Only locking type snaphooks shall be used.
8. Unless the snaphook is designed for the following connections, snaphooks shall not be engaged:
 - a) Directly to webbing, rope or wire rope.
 - b) To each other.
 - c) To a D-ring to which another snaphook or other connector is attached.
 - d) To a horizontal lifeline.
 - e) To any object in which its shape or dimension is incompatible in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.
9. Positioning device systems shall be inspected prior to each use for wear,



Snaphooks for positioning systems must be of the locking type and anchorage points must be able to withstand an impact load of 3,000 pounds (picture courtesy DBI/Sala).



While working on rebar assemblies positioning systems must be secured to both a horizontal and vertical piece of rebar (picture courtesy DBI/Sala).

damage, and other deterioration, and defective components shall be removed from service.

10. Positioning systems and components shall be used only for employee protection and not to hoist materials.

Formwork and Reinforcing Steel

Section 1926.501(b)(5) requires that employees on the face of reinforcing steel must be protected from falling 6 feet or more to lower levels by personal fall arrest systems, safety net systems, or positioning devices. After OSHA published this as a final rule, the National Association of Reinforcing Steel Contractors and the International Association of Bridge, Structural and Ornamental Iron Workers asserted that because of the way the rebar is transported to a work location (workers carry the rebar by cradling it in their arms), it was not feasible, or would create a greater hazard, to constantly connect and disconnect fall protection devices while climbing the rebar assemblies.

For this reason, and because rebar assemblies are similar to a fixed ladder, OSHA has allowed workers while constructing rebar assemblies to climb without fall protection up to 24 feet. Once employees reach their work location, or climb above 24 feet, they must use fall protection as specified by the standard.



Fall protection while working off of concrete forms can be achieved with the use of a retractable lanyard. The system can be installed before lifted into place, and then retrieved with the use of a tagline attached to the snaphook (picture courtesy DBI/Sala).

Personal Fall Restraint System

Fall restraint is an option, which is available in a number of situations. Fall restraint is a system, which physically limits an employee's exposure to a fall hazard by stopping them before they fall. For example, when a cable assembly 20 feet long is attached to an anchor 22 feet from a floor opening and attached to a body harness, this will stop the employee 2 feet before they reach the fall exposure. This system may be used in areas where other systems like; guardrails, hole covers, safety nets etc. cannot be installed or are removed to facilitate work. The following are key concerns when using personal fall restraint and possible applications.

1. Some areas that fall restraint has been used include roofing operations, open sided floors, floor and roof openings, catch platforms and work platforms.
2. The rope or cable being used must be rigged in such a manner to physically restrict access to the hazard.
3. The anchorage point of the rope/cable should be capable of supporting 3,000 pounds or a qualified person maintaining a safety factor of two must evaluate the overall system.
4. Employees must be trained in the use and limitations of fall restraint.
5. Employees must not use the restraining system in the vicinity of other hazards.
6. Fall restraint equipment must be inspected according to manufacturers directions.
7. Unprotected workers must be restricted from approaching the fall hazard.

General Requirements for Personal Fall Restraint Systems

1. Fall restraint systems must meet the same requirements of both the positioning and personal fall arrest systems.
2. Full body harnesses are recommended, but body belts are accepted when using this system.
3. The anchorage point must be capable of supporting 3,000 pounds or two times the intended impact load determined by a qualified person.
4. When a personal fall restraint system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.



Personal fall restraint systems can be used as long as the system physically restricts or stops the employee before they fall.

Specialized Fall Protection Systems

Key systems to be discussed within this section include:

1. Safety Monitor.
2. Warning Line.
3. Safety Monitor/Warning Line.
4. Controlled Access Zone.
5. Fall Protection Plan.

Safety Monitor

The safety monitor system is designed for work on low-sloped roofs, 4/12 pitch or less, and roofs less than 50 feet in width. As stated in 1926.501 (b) (10) any employees performing roofing operations with unprotected sides or edges 6 feet or more above the next level must be provided with fall protection, a safety monitor is one option. Also acceptable are personal fall arrest systems, safety nets and guardrail systems.

If the roof is greater than 50 feet in width, a safety monitor system alone is not acceptable. In this situation a warning line system with a guardrail system, warning line and personal fall arrest, warning line with safety nets or warning line and safety monitor must be used. Also, if the roof is greater than 4/12 pitch, workers involved in roofing operations must be protected from falling by a guardrail system with toeboards, safety nets or personal fall arrest system (1926.501 (b) (11)).

The safety monitoring system and its use shall comply with the following guidelines:

- (1) The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:
 - a. The safety monitor shall be competent to recognize fall hazards;
 - b. The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;
 - c. The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored;
 - d. The safety monitor shall be close enough to communicate orally with the

- employee; and
 - e. The safety monitor shall not have other responsibilities that could take the monitor's attention from the monitoring function.
- (2) Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.
- (3) No employee, other than an employee engaged in roofing work [on low-sloped roofs] shall be allowed in an area where an employee is being protected by a safety monitoring system.

Warning Line

Warning line systems and their use shall comply with the following provisions:

- (1) The warning line shall be erected around all sides of the roof work area.
- a. When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet from the roof edge.
 - b. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet from the roof edge which is perpendicular to the direction of mechanical equipment operation.
 - c. Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
 - d. When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.
- (2) Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:
- a. The rope, wire, or chain shall be flagged at not more than 6-foot intervals with high-visibility material;
 - b. The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches from the walking/working surface and its highest point is no more than 39 inches from the walking/working surface;
 - c. After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds applied horizontally against the stanchion, 30 inches above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof,

- or platform edge;
 - d. The rope, wire, or chain shall have a minimum tensile strength of 500 pounds, and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions as prescribed in paragraph c of this section; and
 - e. The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
- (3) No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area.
- (4) Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

Warning Line/Safety Monitor System

On roofs with a pitch of 4/12 or less and greater than 50 feet in width, a combination of warning line and safety monitor may be used. Remember to comply with the requirements of each system. When an employee is working outside the warning line, they must be monitored by a competent person (safety monitor) who is within visual and verbal range of employees.

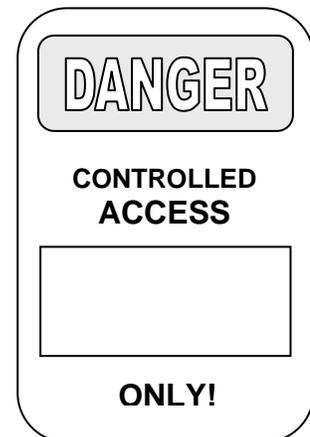
Other options for employees working outside the warning line include personal fall arrest, safety nets or guardrail systems. If there is no guardrail system or personal fall arrest equipment in use, than no mechanical equipment is to be used outside the warning line.

Controlled Access Zone

Controlled access zones are only allowed during leading edge work, overhand brick laying, precast concrete erection and residential construction. In a controlled access zone, a line must identify the area where the specific work is being done and must physically restrict this area to trained employees completing the work.

If a contractor is authorized, and chooses this system, then they should follow these steps to establish an acceptable controlled access zone.

1. Identify the type of controlled access zone required (leading edge, precast concrete, residential and overhand brick laying).
2. Identify the controlled access zone line distance from the work area.
3. Place the appropriate line in the proper location.
4. Place controlled access zone signs in the area.
5. Restrict access to trained employees performing the specific task.



Controlled access zones and their use shall conform to the following provisions:

- (1) When used to control access to areas where **leading edge** and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.
 - a. When control lines are used, they shall be erected not less than 6 feet nor more than 25 feet from the unprotected or leading edge, except when erecting precast concrete members.
 - b. When erecting precast concrete members, the control line shall be erected not less than 6 feet nor more than 60 feet or half the length of the member being erected, whichever is less, from the leading edge.
 - c. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
 - d. The control line shall be connected on each side to a guardrail system or wall.
- (2) When used to control access to areas where overhand bricklaying and related work are taking place:
 - a. The controlled access zone shall be defined by a control line erected not less than 10 feet nor more than 15 feet from the working edge.
 - b. The control line shall extend for a distance sufficient for the controlled access zone to enclose all employees performing overhand bricklaying and related work at the working edge and shall be approximately parallel to the working edge.
 - c. Additional control lines shall be erected at each end to enclose the controlled access zone.
 - d. Only employees engaged in overhand bricklaying or related work shall be permitted in the controlled access zone.
- (3) Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
 - a. Each line shall be flagged or otherwise clearly marked at not more than 6-foot intervals with high-visibility material.
 - b. Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches from the walking/working surface and its highest point is not more than 45 inches [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface.
 - c. Each line shall have a minimum breaking strength of 200 pounds.
- (4) On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones shall be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas.

- (5) On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the guardrail necessary to accomplish that day's work shall be removed.

Fall Protection Plans

A fall protection plan is a last resort for fall protection and is allowed for residential, precast concrete erection and leading edge work *only*. If a contractor chooses to use a fall protection plan, even if the plan is acceptable, **and cannot prove that conventional fall protection options are infeasible or create a greater hazard**, they will be in violation of the standard.

OSHA's definition of infeasible means that it is impossible to perform the construction work using conventional fall protection systems or that it is technologically impossible to use any one of these systems to provide fall protection.

If the fall protection plan is to be implemented, it must follow these guidelines:

- (1) The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction is being performed and the plan must be maintained up to date.
- (2) Any changes to the fall protection plan shall be approved by a qualified person.
- (3) A copy of the fall protection plan with all approved changes shall be maintained at the job site.
- (4) The implementation of the fall protection plan shall be under the supervision of a competent person.
- (5) The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.
- (6) The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.
- (7) The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and the employer must comply with the criteria for controlled access zones

- (8) Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system in conformance with §1926.502(h).
- (9) The fall protection plan must include a statement that provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones. In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incident.
- (10) In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incident.

29 CFR, Part 1926 – Subpart M

Fall Protection

1926.500 Scope, application, and definitions applicable to this subpart

(a)

"Scope and application."

(a)(1)

This subpart sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926. Exception: The provisions of this subpart do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after all construction work has been completed.

(a)(2)

Section 1926.501 sets forth those workplaces, conditions, operations, and circumstances for which fall protection shall be provided except as follows:

(a)(2)(i)

Requirements relating to fall protection for employees working on scaffolds are provided in subpart L of this part.

(a)(2)(ii)

Requirements relating to fall protection for employees working on certain cranes and derricks are provided in subpart N of this part.

..1926.500(a)(2)(iii)

(a)(2)(iii)

Requirements relating to fall protection for employees performing steel erection work are provided in 1926.105 and in subpart R of this part.

..1926.500(a)(2)(iv)

(a)(2)(iv)

Requirements relating to fall protection for employees working on certain types of equipment used in tunneling operations are provided in subpart S of this part.

(a)(2)(v)

Requirements relating to fall protection for employees engaged in the construction of electric transmission and distribution lines and equipment are provided in subpart V of this part.

(a)(2)(vi)

Requirements relating to fall protection for employees working on stairways and ladders are provided in subpart X of this part.

(a)(3)

Section 1926.502 sets forth the requirements for the installation, construction, and proper use of fall protection required by part 1926, except as follows:

(a)(3)(i)

Performance requirements for guardrail systems used on scaffolds and performance requirements for falling object protection used on scaffolds are provided in subpart L of this part.

(a)(3)(ii)

Performance requirements for stairways, stairrail systems, and handrails are provided in subpart X of this part.

(a)(3)(iii)

Additional performance requirements for personal climbing equipment, lineman's body belts, safety straps, and lanyards are provided in Subpart V of this part.

(a)(3)(iv)

Section 1926.502 does not apply to steel erection activities. (Note: Section 1926.104 sets the criteria for body belts, lanyards and lifelines used for fall protection in steel erection activities. Paragraphs (b), (c) and (f) of 1926.107 provide definitions for the pertinent terms).

..1926.500(a)(4)

(a)(4)

Section 1926.503 sets forth requirements for training in the installation and use of fall protection systems, except in relation to steel erection activities.

(b)

Definitions.

"Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.

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

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

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

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

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

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

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

"Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an

employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

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

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

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

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

"Guardrail system" means a barrier erected to prevent employees from falling to lower levels.

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

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

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

"Leading edge" means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

"Lifeline" means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

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

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

"Mechanical equipment" means all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcars.

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

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

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

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

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

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

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

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

"Self-retracting lifeline/lanyard" means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during

normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

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

(b)(1)

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

(b)(2)

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

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

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

"Unprotected sides and edges" means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.

"Walking/working surface" means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

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

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

1926.501 Duty to have fall protection

(a)

"General."

(a)(1)

This section sets forth requirements for employers to provide fall protection systems. All fall protection required by this section shall conform to the criteria set forth in 1926.502 of this subpart.

(a)(2)

The employer shall determine if the walking/working surfaces on which its employees are to work have the strength and structural integrity to support employees safely. Employees shall be allowed to work on those surfaces only when the surfaces have the requisite strength and structural integrity.

(b)

(b)(1)

"Unprotected sides and edges." Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

(b)(2)

"Leading edges."

(b)(2)(i)

Each employee who is constructing a leading edge 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

..1926.501(b)(2)(ii)

(b)(2)(ii)

Each employee on a walking/working surface 6 feet (1.8 m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system. If a guardrail system is chosen to provide the fall protection, and a controlled access zone has already been established for leading edge work, the control line may be used in lieu of a guardrail along the edge that parallels the leading edge.

(b)(3)

"Hoist areas." Each employee in a hoist area shall be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems or personal fall arrest systems. If guardrail systems, [or chain, gate, or guardrail] or portions thereof, are removed to facilitate the hoisting operation (e.g., during landing of materials), and an employee must lean through the access opening or out over the edge of the access opening (to receive or guide equipment and materials, for example), that employee shall be protected from fall hazards by a personal fall arrest system.

(b)(4)

"Holes."

(b)(4)(i)

Each employee on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 feet (1.8 m) above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.

(b)(4)(ii)

Each employee on a walking/working surface shall be protected from tripping in or stepping into or through holes (including skylights) by covers.

(b)(4)(iii)

Each employee on a walking/working surface shall be protected from objects falling through holes (including skylights) by covers.

..1926.501(b)(5)

(b)(5)

"Formwork and reinforcing steel." Each employee on the face of formwork or reinforcing steel shall be protected from falling 6 feet (1.8 m) or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.

(b)(6)

"Ramps, runways, and other walkways." Each employee on ramps, runways, and other walkways shall be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems.

(b)(7)

"Excavations."

(b)(7)(i)

Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier;

(b)(7)(ii)

Each employee at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers.

(b)(8)

"Dangerous equipment."

(b)(8)(i)

Each employee less than 6 feet (1.8 m) above dangerous equipment shall be protected from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.

(b)(8)(ii)

Each employee 6 feet (1.8 m) or more above dangerous equipment shall be protected from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.

..1926.501(b)(9)

(b)(9)

"Overhand bricklaying and related work."

(b)(9)(i)

Except as otherwise provided in paragraph (b) of this section, each employee performing overhand bricklaying and related work 6 feet (1.8 m) or more above lower levels, shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or shall work in a controlled access zone.

(b)(9)(ii)

Each employee reaching more than 10 inches (25 cm) below the level of the walking/working surface on which they are working, shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.

Note: Bricklaying operations performed on scaffolds are regulated by subpart L - Scaffolds of this part.

(b)(10)

"Roofing work on Low-slope roofs." Except as otherwise provided in paragraph (b) of this section, each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet (15.25 m) or less in width (see Appendix A to subpart M of this part), the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

(b)(11)

"Steep roofs." Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

(b)(12)

"Precast concrete erection." Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of precast concrete members, who is 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net

systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

..1926.501(b)(13)

(b)(13)

"Residential construction." Each employee engaged in residential construction activities 6 feet (1.8 m) or more above lower levels shall be protected by guardrail systems, safety net system, or personal fall arrest system unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

(b)(14)

"Wall openings." Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.

(b)(15)

"Walking/working surfaces not otherwise addressed." Except as provided in 1926.500(a)(2) or in 1926.501 (b)(1) through (b)(14), each employee on a walking/working surface 6 feet (1.8 m) or more above lower levels shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.

..1926.501(c)

(c)

"Protection from falling objects." When an employee is exposed to falling objects, the employer shall have each employee wear a hard hat and shall implement one of the following measures:

(c)(1)

Erect toeboards, screens, or guardrail systems to prevent objects from falling from higher levels;
or,

(c)(2)

Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced; or,

(c)(3)

Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

1926.502 Fall protection systems criteria and practices

(a)

"General."

(a)(1)

Fall protection systems required by this part shall comply with the applicable provisions of this section.

(a)(2)

Employers shall provide and install all fall protection systems required by this subpart for an employee, and shall comply with all other pertinent requirements of this subpart before that employee begins the work that necessitates the fall protection.

(b)

"Guardrail systems." Guardrail systems and their use shall comply with the following provisions:

..1926.502(b)(1)

(b)(1)

Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph.

Note: When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts.

(b)(2)

Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high.

(b)(2)(i)

Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.

(b)(2)(ii)

Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.

(b)(2)(iii)

Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches (48 cm) apart.

(b)(2)(iv)

Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.

(b)(3)

Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied within 2 inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.

..1926.502(b)(4)

(b)(4)

When the 200 pound (890 N) test load specified in paragraph (b)(3) of this section is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches (1.0 m) above the walking/working level. Guardrail system components selected and constructed in accordance with the Appendix B to subpart M of this part will be deemed to meet this requirement.

(b)(5)

Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 pounds (666 N) applied in any downward or outward direction at any point along the midrail or other member.

(b)(6)

Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.

(b)(7)

The ends of all top rails and midrails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard.

(b)(8)

Steel banding and plastic banding shall not be used as top rails or midrails.

(b)(9)

Top rails and midrails shall be at least one-quarter inch (0.6 cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high-visibility material.

(b)(10)

When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.

..1926.502(b)(11)

(b)(11)

When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.

(b)(12)

When guardrail systems are used around holes used for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed over with a cover, or a guardrail system shall be provided along all unprotected sides or edges.

(b)(13)

When guardrail systems are used around holes which are used as points of access (such as ladderways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.

(b)(14)

Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

(b)(15)

Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of paragraph (b)(3) of this section.

(c)

"Safety net systems." Safety net systems and their use shall comply with the following provisions:

(c)(1)

Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.

..1926.502(c)(2)

(c)(2)

Safety nets shall extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet.
More than 5 feet up to 10 feet	10 feet.
More than 10 feet	13 feet.

(c)(3)

Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified in paragraph (c)(4) of this section.

(c)(4)

Safety nets and their installations shall be capable of absorbing an impact force equal to that produced by the drop test specified in paragraph (c)(4)(i) of this section.

(c)(4)(i)

Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop-test shall consist of a 400 pound (180 kg) bag of sand 30 + or - 2 inches (76 + or - 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not from less than 42 inches (1.1 m) above that level.

(c)(4)(ii)

When the employer can demonstrate that it is unreasonable to perform the drop-test required by paragraph (c)(4)(i) of this section, the employer (or a designated competent person) shall certify that the net and net installation is in compliance with the provisions of paragraphs (c)(3) and (c)(4)(i) of this section by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined

that the identified net and net installation were in compliance with paragraph (c)(3) of this section and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

..1926.502(c)(5)

(c)(5)

Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

(c)(6)

Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

(c)(7)

The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

(c)(8)

Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2 kN).

(c)(9)

Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

(d)

"Personal fall arrest systems." Personal fall arrest systems and their use shall comply with the provisions set forth below. Effective January 1, 1998, body belts are not acceptable as part of a personal fall arrest system. Note: The use of a body belt in a positioning device system is acceptable and is regulated under paragraph (e) of this section.

..1926.502(d)(1)

(d)(1)

Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(d)(2)

Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(d)(3)

Dee-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds (22.2 kN).

(d)(4)

Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(d)(5)

Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. Effective January 1, 1998, only locking type snaphooks shall be used.

(d)(6)

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

(d)(6)(i)

directly to webbing, rope or wire rope;

(d)(6)(ii)

to each other;

..1926.502(d)(6)(iii)

(d)(6)(iii)

to a dee-ring to which another snaphook or other connector is attached;

(d)(6)(iv)

to a horizontal lifeline; or

(d)(6)(v)

to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

(d)(7)

On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

(d)(8)

Horizontal lifelines shall be 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.

(d)(9)

Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

(d)(10)

(d)(10)(i)

Except as provided in paragraph (d)(10)(ii) of this section, when vertical lifelines are used, each employee shall be attached to a separate lifeline.

(d)(10)(ii)

During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with

guardrails; the strength of the lifeline is 10,000 pounds [5,000 pounds per employee attached] (44.4 kN); and all other criteria specified in this paragraph for lifelines have been met.

..1926.502(d)(11)

(d)(11)

Lifelines shall be protected against being cut or abraded.

(d)(12)

Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(d)(13)

Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(d)(14)

Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

(d)(15)

Anchorage used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows:

(d)(15)(i)

as part of a complete personal fall arrest system which maintains a safety factor of at least two; and

(d)(15)(ii)

under the supervision of a qualified person.

..1926.502(d)(16)

(d)(16)

Personal fall arrest systems, when stopping a fall, shall:

(d)(16)(i)

limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(d)(16)(ii)

limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(d)(16)(iii)

be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;

(d)(16)(iv)

bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and,

(d)(16)(v)

have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

Note: If the personal fall arrest system meets the criteria and protocols contained in Appendix C to subpart M, and if the system is being used by an employee having a combined person and tool weight of less than 310 pounds (140 kg), the system will be considered to be in compliance with the provisions of paragraph (d)(16) of this section. If the system is used by an employee having a combined tool and body weight of 310 pounds (140 kg) or more, then the employer must appropriately modify the criteria and protocols of the Appendix to provide proper protection for such heavier weights, or the system will not be deemed to be in compliance with the requirements of paragraph (d)(16) of this section.

..1926.502(d)(17)

(d)(17)

The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(d)(18)

Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

(d)(19)

Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.

(d)(20)

The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.

(d)(21)

Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.

(d)(22)

Body belts shall be at least one and five-eighths (1 5/8) inches (4.1 cm) wide.

(d)(23)

Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other subparts of this Part.

(d)(24)

When a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

..1926.502(e)

(e)

"Positioning device systems." Positioning device systems and their use shall conform to the following provisions:

(e)(1)

Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9 m).

(e)(2)

Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.

(e)(3)

Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(e)(4)

Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.

(e)(5)

Connecting assemblies shall have a minimum tensile strength of 5,000 pounds (22.2 kN)

(e)(6)

Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(e)(7)

Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. As of January 1, 1998, only locking type snaphooks shall be used.

..1926.502(e)(8)

(e)(8)

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

(e)(8)(i)

directly to webbing, rope or wire rope;

(e)(8)(ii)

to each other;

(e)(8)(iii)

to a dee-ring to which another snaphook or other connector is attached;

(e)(8)(iv)

to a horizontal lifeline; or

(e)(8)(v)

to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

(e)(9)

Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.

(e)(10)

Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

(f)

"Warning line systems." Warning line systems [See 1926.501(b)(10)] and their use shall comply with the following provisions:

..1926.502(f)(1)

(f)(1)

The warning line shall be erected around all sides of the roof work area.

(f)(1)(i)

When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.

(f)(1)(ii)

When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

(f)(1)(iii)

Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.

(f)(1)(iv)

When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.

(f)(2)

Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:

(f)(2)(i)

The rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material;

..1926.502(f)(2)(ii)

(f)(2)(ii)

The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches (.9 m) from the walking/working surface and its highest point is no more than 39 inches (1.0 m) from the walking/working surface;

(f)(2)(iii)

After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the stanchion, 30 inches (.8 m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge;

(f)(2)(iv)

The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN), and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions as prescribed in paragraph (f)(2)(iii) of this section; and

(f)(2)(v)

The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.

(f)(3)

No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area.

(f)(4)

Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

(g)

"Controlled access zones." Controlled access zones [See 1926.501(b)(9) and 1926.502(k)] and their use shall conform to the following provisions.

..1926.502(g)(1)

(g)(1)

When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.

(g)(1)(i)

When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge, except when erecting precast concrete members.

(g)(1)(ii)

When erecting precast concrete members, the control line shall be erected not less than 6 feet (1.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge.

(g)(1)(iii)

The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.

(g)(1)(iv)

The control line shall be connected on each side to a guardrail system or wall.

(g)(2)

When used to control access to areas where overhand bricklaying and related work are taking place:

(g)(2)(i)

The controlled access zone shall be defined by a control line erected not less than 10 feet (3.1 m) nor more than 15 feet (4.5 m) from the working edge.

(g)(2)(ii)

The control line shall extend for a distance sufficient for the controlled access zone to enclose all employees performing overhand bricklaying and related work at the working edge and shall be approximately parallel to the working edge.

..1926.502(g)(2)(iii)

(g)(2)(iii)

Additional control lines shall be erected at each end to enclose the controlled access zone.

(g)(2)(iv)

Only employees engaged in overhand bricklaying or related work shall be permitted in the controlled access zone.

(g)(3)

Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

(g)(3)(i)

Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.

(g)(3)(ii)

Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface.

(g)(3)(iii)

Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

(g)(4)

On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones shall be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas.

(g)(5)

On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the guardrail necessary to accomplish that day's work shall be removed.

..1926.502(h)

(h)

"Safety monitoring systems." Safety monitoring systems [See 1926.501(b)(10) and 1926.502(k)] and their use shall comply with the following provisions:

(h)(1)

The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:

(h)(1)(i)

The safety monitor shall be competent to recognize fall hazards;

(h)(1)(ii)

The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;

(h)(1)(iii)

The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored;

(h)(1)(iv)

The safety monitor shall be close enough to communicate orally with the employee; and

(h)(1)(v)

The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function.

(h)(2)

Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.

..1926.502(h)(3)

(h)(3)

No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.

(h)(4)

Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors.

(i)

"Covers." Covers for holes in floors, roofs, and other walking/working surfaces shall meet the following requirements:

(i)(1)

Covers located in roadways and vehicular aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.

(i)(2)

All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

(i)(3)

All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.

(i)(4)

All covers shall be color coded or they shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard.

Note: This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.

..1926.502(j)

(j)

"Protection from falling objects." Falling object protection shall comply with the following provisions:

(j)(1)

Toeboards, when used as falling object protection, shall be erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below.

(j)(2)

Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 N) applied in any downward or outward direction at any point along the toeboard.

(j)(3)

Toeboards shall be a minimum of 3 1/2 inches (9 cm) in vertical height from their top edge to the level of the walking/working surface. They shall have not more than 1/4 inch (0.6 cm) clearance above the walking/working surface. They shall be solid or have openings not over 1 inch (2.5 cm) in greatest dimension.

(j)(4)

Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.

(j)(5)

Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.

(j)(6)

During the performance of overhand bricklaying and related work:

(j)(6)(i)

No materials or equipment except masonry and mortar shall be stored within 4 feet (1.2 m) of the working edge.

..1926.502(j)(6)(ii)

(j)(6)(ii)

Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear from the work area by removal at regular intervals.

(j)(7)

During the performance of roofing work:

(j)(7)(i)

Materials and equipment shall not be stored within 6 feet (1.8 m) of a roof edge unless guardrails are erected at the edge.

(j)(7)(ii)

Materials which are piled, grouped, or stacked near a roof edge shall be stable and self-supporting.

(j)(8)

Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.

(k)

"Fall protection plan." This option is available only to employees engaged in leading edge work, precast concrete erection work, or residential construction work (See 1926.501(b)(2), (b)(12), and (b)(13)) who can demonstrate that it is infeasible or it creates a greater hazard to use conventional fall protection equipment. The fall protection plan must conform to the following provisions.

(k)(1)

The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction work is being performed and the plan must be maintained up to date.

(k)(2)

Any changes to the fall protection plan shall be approved by a qualified person.

..1926.502(k)(3)

(k)(3)

A copy of the fall protection plan with all approved changes shall be maintained at the job site.

(k)(4)

The implementation of the fall protection plan shall be under the supervision of a competent person.

(k)(5)

The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.

(k)(6)

The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.

(k)(7)

The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and the employer must comply with the criteria in paragraph (g) of this section.

(k)(8)

Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system in conformance with 1926.502(h).

(k)(9)

The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.

..1926.502(k)(10)

(k)(10)

In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

1926.503 Training requirements

(a)

"Training Program."

(a)(1)

The employer shall provide a training program for each employee who might be exposed to fall hazards. The program shall enable each employee to recognize the hazards of falling and shall train each employee in the procedures to be followed in order to minimize these hazards.

(a)(2)

The employer shall assure that each employee has been trained, as necessary, by a competent person qualified in the following areas:

(a)(2)(i)

The nature of fall hazards in the work area;

(a)(2)(ii)

The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;

(a)(2)(iii)

The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;

(a)(2)(iv)

The role of each employee in the safety monitoring system when this system is used;

..1926.503(a)(2)(v)

(a)(2)(v)

The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;

(a)(2)(vi)

The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection; and

(a)(2)(vii)

The role of employees in fall protection plans;

(a)(2)(viii)

The standards contained in this subpart.

(b)

"Certification of training."

(b)(1)

The employer shall verify compliance with paragraph (a) of this section by preparing a written certification record. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this section, the certification record shall indicate the date the employer determined the prior training was adequate rather than the date of actual training.

(b)(2)

The latest training certification shall be maintained.

(c)

"Retraining." When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (a) of this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

..1926.503(c)(1)

(c)(1)

Changes in the workplace render previous training obsolete; or

(c)(2)

Changes in the types of fall protection systems or equipment to be used render previous training obsolete; or

(c)(3)

Inadequacies in an affected employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

Note: The following appendices to subpart M of this part serve as non-mandatory guidelines to assist employers in complying with the appropriate requirements of subpart M of this part.

Definitions – Fall Protection

Access: movement by physical or mechanical means to reach a workstation.

Aerial Lifts: mechanical devices such as manlifts, man-baskets, scissor lifts and bucket trucks used for access to heights.

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

Arresting Force: the amount of force on a worker or test weight resulting from the fall protection system stopping the fall. This usually expresses the peak force experienced during the fall arrest. (See maximum arrest force)

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

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

Body-Restraint System: a single or multiple strap that can be secured around a worker and to which he can attach to a load-bearing anchorage for travel restriction with limited fall hazard such as body belts, chest harnesses and full body harnesses.

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

Carabiner: oblong ring snap hook (Europ.: Karabiner), erroneously called D-ring.

Competent Person: an individual knowledgeable of manufacturer's recommendations, instructions and manufactured components who is capable of identifying existing and predictable hazards in the proper selection, use and maintenance of fall protection.

Connecting means a device or lanyard used to connect the body support to the anchorage in such a way as to provide protected mobility for an elevated work task.

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

Continuous Fall Protection: the design and use of a fall protection system such that no exposure to an elevated fall hazard occurs. This may require more than one fall protection system or a combination of prevention or protection measures.

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

Controlled Descent: a descent automatically controlled at a constant rate of speed through a device that requires no manual manipulation or operation.

D-Ring: an attachment point(s) on the belt or harness for a device or lanyard. (Sometimes erroneously named for a carabiner snap hook)

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

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

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

Double-Locking Snap Hook: see Locking Snap Hook.

Egress: a means of escape from a workstation; e.g., stairs, door or escape device. Not to be confused with NFPA101 means of egress.

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

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

Fall Arrest System: a tested device and any necessary components that function together to arrest a free fall in such a way as to minimize the potential for compounding injury.

Fall Distance: the physical distance from the location of the worker's support prior to a fall and the place at which the person finally comes to a complete stop.

Fall Hazard: Any position from which an accidental fall may reasonably produce injury.

Fall Prevention: any means used to reasonably prevent exposure to an elevated fall hazard(s) such as floors, walls, guardrails and isolating an area.

Fall-Restraint System: a lanyard or device that is designed to restrain a worker in such a manner as to prevent a fall from occurring; e.g., a lineman's pole strap.

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

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

Full Body Harness: a design of single or multiple straps that can be secured around the body to which a lanyard or device can be attached. A full body harness is designed to distribute arresting and suspension forces over the buttocks, thighs, chest and shoulders used for industrial fall protection.

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

Hazard: the potential to incur harm; an agent, energy or characteristic that can cause physical damage to personnel or property.

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

Horizontal Lifeline: a rail, wire or synthetic cable that is installed in a horizontal plane and used for attachment of a worker's lanyard or lifeline device while moving horizontally; used to control dangerous pendulum-like swing falls.

Independent Lifeline: a lifeline that is not attached to the work surface; one lifeline per person.

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

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

Leading edge means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an “unprotected side and edge” during periods when it is not actively and continuously under construction.

Lifeline means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Locking Snap Hook: a connecting snap hook that requires two separate forces to open the gate; one to deactivate the gate keeper and a second to depress and open the gate which automatically closes when released; used to minimize roll-out or accidental disengagement.

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

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

Mechanical equipment means all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcars.

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

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

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

Positioning Belt: a single or multiple strap that can be secured around the worker's body to hold the user in a work position; for example, a lineman's belt, a rebar belt, a window cleaner and a saddle belt.

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

Positioning System: a system employing a bosom chair or saddle belt used in conjunction with a loadline to descend to a work position.

Qualified Engineer: an individual with a degree from an accredited institution or professional certificate who is capable of design, analysis, evaluation, specification and system safety planning in the areas needed for fall hazard control.

Qualified Person: an individual with an appropriate degree from an accredited institution or professional certificate who has special knowledge, training or experience in the areas needed for fall hazard control.

Retracting Lifeline: a fall arrestor whose integral line extends as a worker moves downward and automatically retracts as the worker moves up toward the unit, eliminating slack. Retracting lifelines can have a centrifugal locking mechanism or alternatively centrifugal braking mechanism for controlled descent. (= block; European term)

Risk: the probability of a loss occurring.

Roll-Out: unintentional disengagement of a snap hook caused by the gate being depressed under torque or contact while twisting or turning; a particular concern with single-action snap hooks that do not have a locking gate keeper.

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

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

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

Safety Belt: a generic term originally used for means of body support.

Safety Factor: the ratio of the calculated strength or deceleration of a load bearing member or material to the maximum load or deceleration the component is expected to sustain in actual use.

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

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

Shock Absorbers: a component of a fall protection system that dissipates energy by creating or extending the deceleration distance.

Shock Absorbing Lanyard: a flexible line of webbing, cable or rope used to secure a body belt or harness to a lifeline or anchorage point that has an integral shock absorber.

Single-Action Snap Hook a connecting snap hook that requires a single force to open the gate which automatically closes when released.

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

- (1) The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or
- (2) The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 11 1998, the use of a non-locking snaphook as part of personal fall arrest systems and positioning device systems is prohibited.

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

Suspended Scaffold: a single point or multiple point work platform used for powered or unpowered access up and or down the side of a structure.

Swing Fall: a pendulum-like motion that can result from moving horizontally away from a fixed anchorage and falling. Swing falls generate the same amount of energy as a fall through the same distance vertically but with the additional hazard of colliding with an obstruction or the ground.

Tie-off: the act of a worker securing the end of a lanyard to an anchorage point. Note: The terms tied off, tying off (tying off) are related to tie-off. An anchorage point is sometimes referred to as a tie-off point.

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

Unprotected sides and edges means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.

Walking/working surface means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Warning line system means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work

may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

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