THINK SAFETY

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Fall protection in construction safety guidelines




In the United States, falls are the leading cause of fatalities on a construction site. Employers and employees need to do the following:

- Where protection is required, select fall protection systems appropriate for given situations
- Use proper construction and installation of safety systems
- Supervise employees properly
- Use safe work procedures
- Train workers in the proper selection, use and maintenance of fall protection systems

PROVIDING FALL PROTECTION

If an employee can fall 6 feet or more onto a lower level, fall protection must be provided. In most cases, a guardrail system, a safety net system or a personal fall arrest system must be used. In some cases, fences, barricades, covers, equipment guards or a controlled access zone may be used. Employees must be protected not just from falling off a surface, but from falling through holes and from having objects fall on them from above. These situations include:

- Working in areas with unprotected sides or edges 6 feet or more above a lower level
- Constructing a leading edge
- At risk to fall through a hole in the walking/working surface
- Working on the face of form work or reinforcing steel
- On ramps, runways and other walkways
- Working at the edge of an excavation, well, pit or shaft
- Working above dangerous equipment (even if less than 6 feet)
- Performing overhand bricklaying and related work
- Performing roofing work
- Engaging in precast concrete erection (with certain exceptions)
- Engaged in residential construction (with certain exceptions)

FALL PROTECTION METHODS

Guardrail systems

If the employer chooses to use guardrail systems to protect workers from falls, the systems must meet the following criteria:

- Top edge of the guardrail must be 39–45 inches above the walking/working level
- There must also be protection from falling between the top rail and the walking/working surface. When midrails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level. Midrails, screens, mesh or intermediate vertical members may be used for this protection. There are specific requirements for their installation
- The protective barriers must be strong enough to support a falling employee. Wood, chain and wire rope may be used for top rails and midrails
- The guardrail system must be capable of withstanding a force of at least 200 pounds applied within 2 inches of the top edge in any outward or downward direction
- Midrails, screens, mesh, intermediate vertical members, solid panels and equivalent structural members shall be capable of withstanding a force of at least 150 pounds applied in any downward or outward direction at any point along the midrail or other member
- Intermediate members, such as balusters, when used between posts, shall not be more than 19 inches (48 centimeters) apart
- When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section must be placed across the access opening between guardrail sections when hoisting operations are not taking place
- If guardrails are used at unprotected sides or edges of ramps and runways, they must be erected on each unprotected side or edge

Safety net systems

Safety net systems catch the employee if he/she does fall. The safety nets must be:

- Strong enough to support a falling employee
- Have sufficiently small mesh openings so the employee cannot fall through the net
- Close enough to the walking/working surface so that the fall into the safety net will not injure the employee (never more than 30 feet below the walking/working level)
- Close enough to the edge of the walking/working surface (the **outer edge** of the net between 8–13 feet from the edge of the walking/working surface, depending on the distance to the walking/working surface) so that the falling employee will not slip past the net
- Equipped with a border rope for webbing with a minimum breaking strength of 5,000 pounds
- Capable of absorbing an impact force of a drop test consisting of a 400-pound bag of sand, 30 inches in diameter, dropped from the highest walking/working surface at which workers are exposed, but not from less than 42 inches above that level
- Clear of any fallen items, including, but not restricted to materials, scrap, equipment and tools as soon as possible and at least before the next work shift

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Personal fall arrest systems

A personal fall arrest system places the employee into a body harness that is fastened to a secure anchorage so that he/she cannot fall. Body belts are not acceptable as personal fall arrest systems. Personal fall arrest systems:

- Should allow for no free fall more than 6 feet
- Should allow employees to be rescued promptly after a fall
- Must be inspected prior to each use for wear damage and other deterioration and defective components must be removed from service
- Must have D-rings and snap hooks with a minimum tensile strength of 5,000 pounds
- Shall have ropes and straps (webbing) used in lanyards, lifelines and strength components of body belts and body harnesses made of synthetic fibers
- Shall have anchorages designed, installed and used under the supervision of a qualified person, as a complete personal fall arrest system must maintain a safety factor of at least two (i.e. capable of supporting at least twice the weight expected)
- Must have anchorages independent of any anchorage used to support or suspend platforms and capable of supporting at least 5,000 pounds per person attached
- Must have lanyards and vertical lifelines with a minimum breaking strength of 5,000 pounds

Positioning device systems

- Be set up so that a worker can free fall no farther than 2 feet
- 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
- Must meet the same criteria as personal fall arrest systems for snap hooks, D-rings and other connectors used

Warning line systems

Warning lines shall be erected around all sides of roof work areas. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet from the roof edge parallel to the direction of mechanical equipment operation and not less than 10 feet from the roof edge perpendicular to the direction of mechanical equipment operation. When mechanical equipment is not being used, the warning line must be erected not less than 6 feet from the roof edge.

Warning line systems consist of ropes, wires, chains or supporting stanchions and are set up as follows:

- Flagged at not more than 6-foot intervals with high-visibility material
- Rigged and supported so that the 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
- Have stanchions rigged with warning lines capable of resisting, without tipping, 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
- Contain rope, wire or chain with a minimum tensile strength of 500 pounds, which must support without breaking the load applied to the stanchions as prescribed above
- Attached to 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 the adjacent section before the stanchion tips over

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Controlled-access zones

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

- Consist of ropes, wires, tapes or equivalent materials and supporting stanchions
- Be flagged at least every 6 feet with high-visibility material
- Be no less than 39 inches from the working surface at its lowest point and no more than 45 inches from the working surface at its highest point (50 inches in overhand bricklaying operations)
- Have a minimum breaking strength of 200 pounds

Safety monitoring systems

When no other alternative fall protection has been implemented, the employer shall implement a safety monitoring system. Employers must appoint a competent person to monitor the safety of workers and the employer shall ensure that the safety monitor is:

- Competent in the recognition of fall hazards
- Capable of warning workers of fall hazard dangers and in detecting unsafe work practices
- Operating on the same walking/working surfaces of the workers and can see them
- Close enough to work operations to communicate orally with workers and has no other duties to distract from the monitoring function

NOTE: 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-sloped roofs. No worker, other than one engaged in roofing work (on low-sloped roofs) or one covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system. All workers in a controlled-access zone shall be instructed to promptly comply with fall hazard warnings issued by safety monitors.

Leading edges

Each employee who is constructing a leading edge 6 feet or more above lower levels shall be protected by guardrail systems, safety net systems or personal fall arrest systems. If the employer can demonstrate that it is infeasible or creates a greater hazard to implement these systems, he or she must develop and implement a fall protection plan that meets the requirements of 29 CFR 1926.502(k).

Hoist areas

Each employee in a hoist area shall be protected from falling 6 feet or more by guardrail systems or personal fall arrest systems. If guardrail systems, chain gate, or portions thereof must be removed to facilitate hoisting operations, as during the landing of materials, and a worker must lean through the access opening or out over the edge of the access opening to receive or guide equipment and materials, that employee must be protected by a personal fall arrest system.

Holes

Holes are defined as a gap or void 2 inches or more in its least dimension, in a floor, roof or other walking working surfaces. Personal fall arrest systems, covers, or guardrail systems shall be erected around holes (including skylights) that are more than 6 feet above lower levels.

If covers are used, they must be:

- Able to support at least twice the weight of employees, equipment and materials that may be imposed on them at one time
- Secured to prevent accidental displacement from wind, equipment or workers' activities
- Color coded or bear the markings "HOLE" or "COVER."

NOTE: All floor holes must be protected against slips and trips—even if less than 6 feet to the lower level.

Ramps, runways and other walkways

Each employee using ramps, runways and other walkways shall be protected by guardrail systems against falling 6 feet or more.

Excavations

Employees at the edge of an excavation 6 feet or more deep shall be protected from falling by guardrail systems, fences, barricades or covers. If walkways are used to permit workers to cross over excavations, guardrails are required on the walkway if the fall would be 6 feet or more to the lower level.

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 meters) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 meter) above the walking/working surface must be protected from falling by the use of either a guardrail system, a safety net system or a personal fall arrest system.

ROOFING

Low-slope roofs

Each employee engaged in roofing activities on low-slope roofs with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems or a combination of a warning line system and guardrail system, warning line system and safety net system, warning line system and personal fall arrest system or warning line system and safety monitoring system.

NOTE: On roofs 50 feet or less in width, the use of a safety monitoring system without a warning line system is permitted.

Steep roofs

Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 meters) or more above lower levels shall be protected by either guardrail systems with toe boards, a safety net system or a personal fall arrest system.

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SCAFFOLDING

- Designated and trained competent persons shall be the only employees authorized to erect scaffolding
- Scaffolding components should be inspected daily prior to use by competent individuals
- Standard guardrails should be provided
- Scaffolding should be secured to prevent tipping or swaying
- Provide personal fall arrest systems where needed as determined by pre-job review
- Wooden planks shall be not less than 2x8 material that has not been spliced

LADDERS

- Ladders should be selected for the intended task
- Ladder construction should conform to the latest American National Standards Institute (ANSI) codes
- The supports, on which a ladder rests at the top and bottom, should be capable of supporting loads to be imposed
- Ladders should be selected with sufficient length for the task
- Ladders should be tied at top with firm and level at base
- Side rails should extend at least 36 inches above roof edge
- Proper ladder slant of 1/4 should be provided
- Ladders should be in good maintenance
- Three-point contact should followed when using ladder

TRAINING

Training must be provided, in accordance with CFR 1926.503, to each employee who might be exposed to fall hazards. In construction, this will involve most employees. The training by a competent person must enable each employee to recognize the hazards of falling and train employees in the procedures to be followed to minimize these hazards.

The training must include:

- The nature of fall hazards in the work area
- The correct procedures for erecting, maintaining, disassembling and inspecting the fall protection systems to be used
- 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
- The role of each employee in the safety monitoring system when this system is used
- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs.
- The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection
- The role of employees in fall protection plans
- The standards of CFR 1926 Subpart M – Fall Protection 1926.500
- A written certification record verifying compliance with the training requirements
- The ability to retrain any employee when the employer has reason to believe that the trained employee does not have the understanding and skills required

The information contained in this service bulletin was obtained from reliable sources. However, United Fire Group accepts no legal responsibility for the correctness or completeness of this information.

Fall protection in construction safety guidelines

SUMMARY

The above should not be considered all inclusive guidelines for fall protection in construction. These guidelines are provided to assist your loss control efforts toward improving employee safety while at the work site. United Fire Group (UFG) risk control consultants are available to you with technical assistance as requested. If further assistance is required, please call 800-828-2705.

RELATED REFERENCES

CFR 1926 Subpart M – Fall Protection 1926

CFR 1926 Subpart X – Stairways and Ladders 1926

CFR 1926 Subpart M – Fall Protection 1926.501 and 1926.502