



## **FALL PROTECTION PROGRAM**

Mechworks has developed this plan for compliance with NIOSH Standard 29CFR1926.503. Generally speaking, some type of fall protection is required anytime an employee is exposed to a potential fall of more than six feet in construction situations and 4 feet or more in manufacturing situations. The four-foot rule also applies to telecommunication tower work. However, this distance may be reduced significantly if a fall would expose an employee to an impaling hazard, energized electrical hazard, or exposed moving machinery parts. In these cases, fall protection suitable to prevent injury would be required.

The design of the total system is extremely important. As an example, a few extra feet of free fall will significantly increase the arresting force on the employee and thus could lead to serious injury. While the absolute limit is 6 feet, the potential free fall distance should always be kept to a minimum. To help ensure this, attachment points should always be located at or above the connection point of the fall arrest equipment. Another important consideration is that the arresting force also goes up exponentially with greater fall distances, and, thus, the overall system strength limits might be exceeded (see section titled "Horizontal Lifeline Forces" for critical information about forces on horizontal lifelines or horizontal components of fall arrest systems). Other factors involved are proper anchorage points, elongation of system components such as life lines, employee/tool weight, and potential hazards during a fall such as protruding objects.

Attachment points used for fall arrest or positioning systems shall be approved by a competent person. All fall protection equipment, such as lanyards, harnesses, rope grabs, self-retracting lifelines, and similar devices shall be inspected semi-annually by a qualified person. These inspections shall be conducted during the months of January and July each year. Inspections shall be documented and equipment shall be marked in such a way that employees can readily tell that this required inspection has been accomplished. A sample inspection list can be found in the section titled "Fall Protection Equipment Inspection".

Various types of systems are available to protect employees. These systems and their components, and the specific design requirements of each are summarized in the remainder of this section.

### **Guardrail Systems**

A guardrail system must have components that meet the following minimum requirements (system normally requires top rails, mid rails, and toe boards):

Have top rails or equivalent system members 42 inches plus or minus 3 inches above the walking/working level (if stilts are being used, the top rail height must be increased an amount equal to the height of the stilts). 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 section.

Have midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members 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 high. Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level. 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. If intermediate members are used as posts, they shall not be more than 19 inches apart. Other structural members, such as additional midrails and architectural panels, shall be installed so there are no openings in the guardrail system more than 19 inches wide.

Normally have toe boards to prevent falling objects from injuring employees or equipment below.

Guardrail systems 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, at any point along the top edge. The top edge of the guardrail shall not deflect to a height less than 39 inches above the walking/working level if these forces are applied.

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.

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

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

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

Top rails and midrails shall be at least one-quarter inch 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.

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.

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

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.

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

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

Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure it continues to meet the strength requirements and height requirements of this section.

#### Safety Net System

Safety nets require extensive design and testing and certification, including special actions by a competent person. Safety net systems must comply with 29 CFR 1926.502.

#### Personal Fall Arrest System

A personal fall arrest system must meet the following requirements:

The total weight of the employee and equipment must not exceed 310 pounds unless the system has been modified as outlined at the end of this paragraph. Fall arrest equipment, other than lifelines, must be commercially purchased and must meet ANSI design criteria for use as a component of a fall arrest system. It must have the original manufacturer's label, including date of manufacturer. Equipment that does not meet these criteria must be removed from service.

Snaphooks must be of the locking type and be of proper design and size to hook to the type anchorage used.

Lanyards and vertical lifelines must have a breaking strength of at least 5000 pounds. A separate lifeline must be provided for each employee.

Lifelines must be protected against being cut or abraded.

Self-retracting lifelines and lanyards that automatically limit free fall distance to two feet or less must be capable of sustaining a minimum tensile load of 3000 pounds. Those that do not limit distance to two feet or less and rip stitch lanyards and tearing and deforming lanyards must be capable of sustaining a minimum tensile load of 5000 pounds.

Ropes or straps used in lanyards, lifelines, and strength components of belts and harnesses must be made from synthetic fibers.

Anchorage used for attachment of personal fall arrest equipment (including lifelines) must be independent of any anchorage used to support or suspend platforms and must be capable of supporting a minimum of 5000 pounds. These anchorages must provide a safety factor of at least 2 and be installed under the supervision of a qualified person and approved by a competent person.

Fall arrest lanyards must be rigged in such a way that the employee cannot fall more than six feet, nor contact any lower level during a fall. The lanyard must also bring the employee to a complete stop and limit maximum deceleration distance to 3.5 feet and maximum arresting force to 1,800 pounds.

Fall arrest lanyards (as opposed to positioning lanyards) should have a deceleration device installed.

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.

Fall arrest components such as lifelines and lanyards shall not be attached to guardrail systems.

Components used as a part of a fall arrest system must never be used to hoist materials.

Any component of a fall arrest system subjected to impact loading must be removed from service.

Components of the fall arrest system must be inspected prior to each use and any defects found must be corrected before use.

Attachment points must be approved by a competent person.

Employees must either be able to rescue themselves in the event of a fall or the employer must make provisions for prompt rescue.

Personal fall arrest systems designed for use by employee's who have a total combined tool and body weight of 310 pounds or greater require special considerations. The component design criterion above is based on a weight of less than 310 pounds. Weights of 310 pounds or more may exceed the safety factors involved for anchorage points and equipment design or may result in arresting forces on the employee of over 1800 pounds with a body harness. Therefore, if the total combined weight of the employee and tools is 310 pounds or greater, the fall arrest system shall be modified to ensure a safety factor of at least two and to limit arresting forces to 1800 pounds or less. A qualified engineer should make this modification.

#### Positioning Device Systems (Fall Restraint System)

A positioning device system must meet the following minimum requirements:

Positioning devices must be rigged so that an employee cannot free fall more than two feet and be secured to an anchorage capable of supporting at least twice the potential impact load of the employee's fall or 3000 pounds, whichever is greater.

Lanyards used for positioning must be commercially manufactured to meet ANSI Standards for either positioning or fall arrest and must be marked with the manufacturer's name and date of manufacturer.

Connectors used on positioning devices must be of the locking type.

Connecting assemblies must have a minimum tensile strength of 5000 pounds.

Snaphooks must be sized and be compatible with the anchorage point.

Positioning systems must be inspected prior to each use and any defects found corrected prior to use.

Components shall only be used for employee protection and not to hoist materials.

Attachment points must be approved by a competent person.

#### Warning Line Systems

Warning line systems, and their use, must meet the following minimum requirements:

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

When mechanical equipment is not being used, the warning line shall be erected not less than six feet from the roof edge.

If mechanical equipment is being used, the warning line shall be erected at least 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 that is perpendicular to the direction of mechanical equipment operation.

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.

When the path to a point of access is not in use, a rope, wire, chain, or other barricade shall be placed across the path at the point where the path intersects the warning line around the work area, or the path shall be offset to prevent a person from walking directly into the work area.

Warning line systems shall consist of ropes, wires, or chains, and supporting stanchions flagged at not

more than six foot intervals with high visibility material.

Warning lines must be rigged and supported in such a way that their lowest point is no less than 34 inches from the walking/working surface and their highest point is no more than 39 inches from the walking/working surface.

Warning lines must 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 potential fall.

The rope, wire, or chain must have a minimum tensile strength of 500 pounds.

The line must 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.

Employees are not allowed in the area between a roof edge and a warning line unless they must perform roofing work in that area.

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

#### Controlled Access Zones

Controlled access zones, and their use, must meet the following minimum requirements:

Control lines must consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions flagged or otherwise clearly marked at not more than six foot intervals with high-visibility material. Control lines must be not less than 39 inches, or more than 45 inches from the walking/working surface.

Each line must have a minimum breaking strength of 200 pounds.

When used to control access to areas where leading edge and other operations are taking place, the controlled access zone must be defined by a control line or by any other means that restricts access. These lines must be erected not less than six feet, nor more than 25 feet, from the unprotected or leading edge and must be approximately parallel to the unprotected or leading edge. The line must be connected on each side to a guardrail system or wall.

#### Safety Monitoring Systems

Safety monitoring systems will only be implemented in very limited circumstances, and their use, must meet the following minimum requirements:

Safety monitor system (stand-alone) may only be used on roofs 50 ft. or less in width. It may still be used in conjunction with other fall protection systems.

A safety monitor may only be used in lieu of other fall protection systems during built-up roofing operations on low pitched roof perimeters.

A Safety Monitor must be designated to monitor the safety of other employees.

The Safety Monitor must be knowledgeable in all tasks to be performed and be able to recognize fall hazards.

The Safety Monitor must be close enough to communicate orally with the employee performing the work and must remain on the same walking/working surface and within visual sighting distance of the employee being monitored.

The Safety Monitor must have no other responsibilities that could take their attention from the monitoring function.

The Safety Monitor must immediately warn the working employee when it appears that they are unaware of a fall hazard or are acting in an unsafe manner.

Mechanical equipment must not be used or stored in the area.

No other employees, except those engaged in the roofing work and the safety monitor is to be allowed in the area.

### Covers

Covers must meet the following minimum requirements:

Covers located in roadways and vehicular aisles shall be capable of supporting at least twice the maximum axle load of the largest vehicle expected to cross the cover.

Covers located in locations other than roadways and vehicular aisles shall be capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

Covers shall be secured when installed so wind, equipment, or employees will not accidentally displace them.

Covers shall be color-coded or marked with the word "HOLE" or "COVER" to provide warning of the hazard (does not apply to manhole covers).

### Protection from Falling Objects

Falling object protection shall comply with the following provisions:

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.

Toeboards shall be capable of withstanding a force of at least 50 pounds applied in any downward or outward direction at any point along the toeboard.

Toeboards shall be a minimum of 3 ½ inches in vertical height from their top edge to the level of the walking/working surface. They shall have not more than ¼ inch clearance above the walking/working surface and be solid or have openings not over one inch in greatest dimension.

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

If a guardrail system is used as falling object protection, it shall have openings small enough to prevent passage of potential falling objects.

During overhand bricklaying and related work, no material and equipment except masonry and mortar shall be stored within 4 feet of the working edge and excess mortar and other materials and debris shall be kept clear from the work area by removal at regular intervals.

During roofing work materials and equipment shall not be stored within six feet of the roof edge unless guardrails are erected at the edge and materials that are piled, grouped, or stacked near the roof edge shall be stable and self-supporting.

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