

## Fall Protection

### Table of Contents

- Purpose
- Definitions
- Responsibility
- Fall Protection Program
- Training
- Fall Protection Systems
- Appendix A
- References

---

#### Purpose

To establish minimum requirements for practices and procedures to protect employees from hazards of falls when working in elevated work areas such as rooftops, platforms and aerial lifts. All employees, students, volunteers, and contractors working under direct NCF supervision shall comply with all elements of the NCF Fall Protection Program

---

#### Responsibility

Environmental Health & Safety

Develop, maintain, distribute, and provide oversight in accordance with all applicable federal and state regulations, and best industry practices. EH&S staff, supervisors and PIs have the responsibility and authority to halt any unsafe practices not in accordance with this policy. Environmental Health and Safety (EH&S) has the responsibility for assisting departments in developing appropriate fall protection plans, providing technical guidance and assisting with employee training.

Departments – Comply with all policy and program elements.

---

#### Definitions

**Fall Protection System** - Fall Protection Systems are designed to protect personnel from the risk of falls when working at elevated heights. Recognized systems include:

**Fall Prevention** - a structural design to limit a fall to the same level (e.g., guardrails, positioning/restraint systems).

**Fall Arrest System** - an approved full body harness, shock absorbing lanyard or self retractable lifeline, locking snap hooks and anchor points approved for a static load of 5000 pounds or engineered to meet a two to one safety factor.

**Aerial Lift** - Vehicle mounted elevating work platform (e.g. Boom Lifts, Articulating Telescoping Boom Lifts).

**Competent Person** - A person who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are hazardous to personnel and who has authorization to quickly correct the situation.

**Qualified Person** - A person with a recognized degree or professional certificate, (e.g. civil or mechanical engineering profession or Certified Safety Professional) and extensive knowledge and experience in this area, capable of doing design, analysis, evaluation and specifications.

**Certification** - ANSI (American National Standards Institute) defines certification as documentation that determines criteria meets the requirements of the standard through testing or proven analytical method (e.g. engineering calculations) or both, carried out under the supervision of a Qualified Person..

---

## Fall Protection Program

Each year over 100,000 injuries and deaths are attributable to work-related falls. The Bureau of Labor Statistics show falls as one of the leading causes of occupational death. An OSHA study involving 99 fall-related fatalities suggests that all of the deaths could have been prevented by the use of fall protection. Fall protection can be in the form of guardrails, personal fall arrest systems, or under specific conditions, warning line systems.

All work performed in elevated areas such as aerial lifts, roofs, elevated platforms, on top of industrial equipment, building ledges, etc. shall be in accordance with this policy and the referenced fall protection program.

An employee must be protected from falling when working on a surface that has an unprotected side or edge, which is 6 feet or more above an adjacent lower level, or when working from bucket trucks or other personnel lifts with articulating booms.

In each of these cases, the fall hazards must be evaluated to determine the preferable method to protect the employee.

### Responsibilities

Supervisors have the primary responsibility for the implementation of the Fall Protection Program in their work area. The supervisor should be a competent person, as defined by OSHA, or ensure that responsibility for the competent person is assigned to a qualified individual within the work group. OSHA defines a competent person as:

- 1) A person who is capable of identifying existing and predictable hazards in the surroundings or identifying working conditions which are hazardous or dangerous to employees and;
- 2) Who has authorization to take prompt corrective measures to eliminate them.

Supervisors must assure that only trained individuals are assigned work that requires use of fall protection systems (other than guardrails).

Employees have the primary responsibility for proper care, use and inspection of their assigned fall protection equipment.

Departments have the primary responsibility for providing fall protection systems and appropriate training.

Environmental Health and Safety (EH&S) has the responsibility for assisting departments in developing appropriate fall protection plans, providing technical guidance and assisting with employee training.

## Training

Each employee who may be exposed to fall hazards will be trained to recognize the hazards and the procedures to follow to minimize the hazards. A competent person will provide the training.

The competent person must train employees in the following areas:

- fall hazards in the work area
- correct procedures for erecting, maintaining, disassembling and inspecting the fall protection systems used
- use and operation of the fall protection systems used
- role of employees in fall protection plans
- what rescue procedures to follow in case of a fall
- overview of the OSHA fall protection standards

A training record will be maintained for each employee. The record will contain the name of the employee trained, date of training and the signature of the person who conducted the training. Retraining should be done if there is a change in the fall protection system being used or if an employee's actions demonstrate that the employee has not retained the understanding or skills important to fall protection.

## Fall Protection Systems

One of the following systems should be in place whenever an employee is exposed to a fall of greater than six feet.

### Guardrail systems

Guardrails are needed at the edge of work areas 6 feet or more in height to protect employees from falling. This includes the edge of excavations greater than six feet in depth. Guardrail systems need to meet the following criteria:

- Toprail is 42 inches, +/- 3 inches above the walking/working level
- Midrail is located midway between the top rail and the walking/working level
  - It is important to remember that the working level is that level where the work is being done. Someone working on a stepladder next to an edge may raise his/her working surface well above the walking surface.
- Both top and midrails should be constructed of materials at least one-quarter inch in thickness or diameter. If wire rope is used for top rails, it needs to be flagged with a high-visibility material at least every 6 feet and can have no more than 3" of deflection
- The toprail needs to withstand a force of 200 pounds when applied in any downward or outward direction.
- The midrail needs to withstand a force of 150 pounds applied in any downward or outward direction
- The system should be smooth to prevent punctures, lacerations or snagging of clothing
- The ends of the top rail should not overhang the terminal posts, except when such overhang does not present a projection hazard
- When a hoisting area is needed, a chain, gate or removable guardrail section must be placed across the access opening when hoisting operations are not taking place.

## **Personal Fall Arrest Systems**

Personnel requiring the use of personal fall protection equipment shall employ the "Buddy System" or have an observer to render assistance when and if required.

There are three main components to the personal fall arrest system. This includes the personal protective equipment the employee wears, the connecting devices and the anchorage point. Prior to tying off to perform the work a means of rescue in the event of a fall must be immediately available. The system needs to meet the following criteria for each component:

### **Personal Protective Equipment**

**Full body harnesses are required.** The use of body belts is prohibited. The attachment point of the body harness is the center D-ring on the back. Employees must **always** tie off at or above the D ring of the harness except when using lanyards 3 feet or less in length. Harnesses or lanyards that have been subjected to an impact load shall be destroyed. Load testing shall not be performed on fall protection equipment.

#### **Connecting devices**

- This device can be a rope or web lanyard, rope grab or retractable lifeline.
- Only locking snaphooks may be used.
- Horizontal lifelines will be designed by a qualified person and installed in accordance with the design requirements.
- Lanyards and vertical lifelines need a minimum breaking strength of 5,000 pounds.
- Lanyards may not be clipped back to itself (e.g. around an anchor point) unless specifically designed to do so.
- If vertical lifelines are used, each employee will be attached to a separate lifeline.
- Lifelines need to be protected against being cut or abraded

#### **Anchorage**

Secure anchor points are the most critical component when employees must use fall arrest equipment. NCF buildings may have existing structures (e.g., steel beams that may meet the criteria for a secure anchor point). Other work locations and assignments may require the installation of a temporary or permanent anchor. As a minimum, the following criteria must be considered for each type of anchor point:

- Structure must be sound and capable of withstanding a 5000 lb. static load/person attached.
- Structure/anchor must be easily accessible to avoid fall hazards during hook up.
- Direct tying off around sharp edged structures can reduce breaking strength by 70% therefore; chafing pads or abrasion resistant straps must be used around sharp edged structures to prevent cutting action against safety lanyards or lifelines.
- Structures used as anchor points must be at the worker's shoulder level or higher to limit free fall to 6 feet or less and prevent contact with any lower level (exception – when self retracting lifelines and or 3 foot lanyards are used)
- Choose structures for anchor points that will prevent swing fall hazards. Potentially dangerous "pendulum" like swing falls can result when a worker moves horizontally away from a fixed anchor point and falls. The arc of the swing produces as much energy as a vertical free fall and the hazard of swinging into an obstruction becomes a major factor. Raising the height of the anchor point can reduce the angle of the arc and the force of the swing. Horizontal lifelines can help maintain the attachment point overhead and limit the fall vertically. A qualified person must design a horizontal lifeline.

### **Permanent Anchor Requirements**

In addition to all the criteria listed above, the following points must be considered:

- Environmental factors and dissimilarity of materials can degrade exposed anchors.
- Compatibility of permanent anchors with employee's fall arrest equipment.
- Inclusion of permanent anchors into a Preventive Maintenance Program with scheduled annual re-certification.
- Visibly label permanent anchors.
- Anchors must be immediately removed from service and re-certified if subjected to fall arrest forces.

### **Reusable Temporary Anchors:**

Reusable temporary roof anchors must be installed and used following the manufacturer's installation guidelines.

- Roof anchors must be compatible with employee's fall arrest equipment.
- Roof anchors must be removed from service at the completion of the job and inspected prior to reuse following the manufacturer's inspection guidelines.
- Roof anchors must be immediately removed from service and disposed of if subjected to fall arrest forces.

### **Complete system**

If a fall occurs, the employee should not be able to free fall more than 6 feet nor contact a lower level.

- To ensure this, add the height of the worker, the lanyard length and an elongation length of 3.5 feet. Using this formula, a six-foot worker with a six-foot lanyard would require a tie-off point at least 15.5 feet above the next lower level.
- A personal fall arrest system that was subjected to an impact needs to be removed from service immediately.
- Personal fall arrest systems need to be inspected prior to each use and damaged or deteriorated components removed from service.
- Personal fall arrest systems should not be attached to guardrails or hoists.

### **Work from Aerial Lifts and Self Powered Work Platforms**

Body harnesses must be worn with a shock-absorbing lanyard (preferably not to exceed 3 feet in length) and must be worn when working from an elevated work platform (exception: scissor lifts and telescoping lifts that can move only vertically do not require the use of a harness and lanyard as long as the work platform is protected by a guardrail system). The point of attachment must be the lift's boom or work platform. Personnel cannot attach lanyards to adjacent poles, structures or equipment while they are working from the aerial lift. Personnel cannot move an aerial lift while the boom is in an elevated working position and the operator is inside of the lift platform.

### **Inspection**

The employee will inspect the entire personal fall arrest system prior to every use. The competent person will inspect the entire system in use at the initial installation and weekly thereafter. The visual inspection of a personal fall arrest system periodically will follow the manufacturer's recommendations. An example of a complete inspection is in Appendix A.

### **Warning Line Systems and Controlled Access Zones**

Warning line systems and work in controlled access zones must be developed in accordance with OSHA regulation 1926.502 and must be approved by EH&S or their designee before employees are exposed to fall hazards.

### **Monitoring System**

OSHA emphasizes that safety-monitoring systems are a last resort and may only be used when other systems are infeasible or present a greater hazard. Monitoring systems must be developed in accordance with OSHA regulation 1926.502 and must be approved by EH&S, or their designee before employees are exposed to fall hazards.

## Appendix A

### Personal Fall Arrest System Inspection

**All fall protection equipment shall be inspected before each use in accordance with the manufacturer's instructions.** The following is general guidance for the inspection of this equipment.

#### **Harness Inspection**

##### **Webbing**

- Inspect the entire surface of webbing for damage. Beginning at one end, bend the webbing in an inverted "U". Holding the body side of the belt toward you, grasp the belt with your hands six to eight inches apart. This surface tension makes the damaged fibers or cuts easier to see. Watch for frayed edges, broken fibers, pulled stitches, cuts, burns, and chemical damage.

##### **"D" Rings/Back Pads**

- Check "D" rings for distortion, cracks, breaks, and rough or sharp edges. The "D" ring should pivot freely. "D" ring back pads should also be inspected for damage.

##### **Attachment of Buckles**

- Note any unusual wear, frayed or cut fiber, or distortion of the buckles.

##### **Tongue/Grommet**

- The tongue receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. The webbing should not have any additional punched holes.

##### **Tongue Buckle**

- Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. The roller should turn freely on the frame. Check for distortion or sharp edges.

##### **Friction and Mating Buckles**

- Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar.

##### **Lanyard Inspection Hardware**

- **Snaps:** Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.
- **Thimbles:** The thimble must be firmly seated in the eye of the splice, and splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.

### **Web Lanyard**

- While bending the webbing over a curved surface such as a pipe, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Examine the webbing for swelling, discoloration, cracks, or burns. Observe closely for any breaks in the stitching.

### **Rope Lanyard**

- Rotation of the rope lanyard while inspecting from end to end will bring to light any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change from the original diameter. The rope diameter should be uniform throughout, following a short break-in period. Make sure the rope has no knots tied in it. Knots can reduce the strength of the rope by up to 60%.

### **Shock-absorbing Lanyard**

- Shock-absorbing lanyards should be examined as a web lanyard. However, also look for signs of deployment. If the lanyard shows signs of having been put under load (e.g. torn out stitching), remove it from service.

### **References**

OSHA 29CFR 1926 Subpart M, OSHA 29CFR 1910.23, OSHA 29CFR 1910.66, OSHA 29CFR 1910.132, OSHA 29CFR 1910.269, Governors Executive Order 2000-292.