

## 1.0 PURPOSE:

The purpose of this document is to establish procedures to eliminate, prevent, and control fall hazards. It will also provide information regarding safe work practices when working on elevated work surfaces.

## 2.0 SCOPE:

This program applies to all University of Pennsylvania (Penn) employees who must perform work tasks from an elevated surface.

## 3.0 REFERENCES

- 3.1 29 CFR 1910 Subpart D
- 3.2 29 CFR 1910 Subpart F
- 3.4 29 CFR 1926 Subpart M
- 3.5 ANSI Z359.1

## 4.0 DEFINITIONS:

**Anchorage** - A fixed structural member that provides a secure means of attachment for a Personal Fall Arrest System. The following are examples of anchorages: beams, girders, columns, angle iron, and steel cables capable of withstanding a 5,000 lb. load for each person.

**Anchorage Connector** - A component or subsystem with means specifically intended for coupling the Personal Fall Arrest System to an anchorage. The following are examples of anchorage connectors: carabiners, eyebolts, and rings.

**ANSI (American National Standards Institute)** - The organization whose certification must appear on all personal Fall Protection (FP) equipment used by Penn employees.

**Boatswain Chair** - A seat supported by slings attached to a suspended rope, designed to accommodate one worker in a sitting position (not authorized for use by Penn employees).

**Body Harness** - an engineered system of straps secured about the employee in a manner that will distribute the fall arrest forces over the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

**Climbing** - When used in the context of this procedure, climbing shall be defined as accessing structures by means other than walking and working surfaces. This includes ascending, descending, or scaling of structures, such as steel structures, steel poles, towers, wood poles, piping, girders, columns, beams, equipment or any other structure not specifically designed for or designated as a walking or working surface.

**Competent Person** - One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate such hazards. The

Competent Person shall receive the appropriate training to be designated in writing as a qualified Competent Person.

**Designated Area** - A Fall Protection method established by Penn that complies with OSHA allowing the use of a distance from edge or a “Warning Line System” in lieu of conventional fall protection methods.

**Engineered Anchorages** - Anchorages, designed by a registered Professional Engineer, may be used with a Personal Fall Arrest System that meets or exceeds American National standards Institute (ANSI) Z359.1-1992 and OSHA regulations.

**Free Fall Distance** - The vertical fall distance before the fall arrest system takes effect.

**Hazard Identification** - A Competent Person will evaluate each situation or work procedure where employees may be exposed to a fall of 4 feet or more. The Competent Person will be responsible for developing a plan to eliminate the exposures, if possible, or to select the appropriate fall protection systems and/or equipment.

**Horizontal Life Line** - A line or cable secured to an anchorage used to allow horizontal movement with a Personal Fall Arrest System.

**Lanyard** - A flexible line used to secure a body harness to a lifeline, deceleration device, or anchorage, with a maximum length that limits a fall to no greater than 6 feet.

**Personal Fall Arrest System** - An assembly used to arrest a person in a fall, consisting of a harness and various equipment that provides for a secure connection to an anchorage. The connection to the anchorage may employ a variety of equipment including lanyards with a shock-absorbing device, lifelines, self-retracting lanyards, or rope grabs.

**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. Body belts shall not be used for fall arrest.

**Qualified Person** - one who, by possession of a recognized degree, certificate, or professional standing (e.g. P.E.), or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

**Self-retracting Lifeline** - A deceleration device that contains a line that can be slowly extracted from or retracted onto a drum during normal employee movement, which after onset of a fall, automatically locks to arrest the fall.

**Shock Absorbers** - A component of a fall arrest system which allows dissipation of energy by extending the deceleration distance.

**Sliding Beam Clamps** - An anchorage connector designed to move along a horizontal beam with an attached fall arrest system.

**Vertical Life Line** - A line or cable secured to an anchorage used to allow vertical movement with a Personal Fall Arrest System.

**Walking & Working Surfaces** - Surfaces such as stairs, floors, scaffolding and any other surfaces designed, engineered or designated for walking and working.

**Warning Line System** – 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 work may take place without the use of guardrail, body belt, or safety net systems for employees in the area.

## 5.0 RESPONSIBILITIES:

- 5.1 The Executive Director of Environmental Health and Radiation Safety (EHRS) or their designee(s) shall ensure uniform implementation and compliance with this program by all employees.
- 5.2 The Qualified (ex. P.E.) or Competent Person (ex. Jobsite Supervisor and/or Lead) shall ensure employees receive the appropriate training and develop guidelines that will eliminate or minimize the potential for injury due to falls. The Supervisor shall approve of the fall protection strategies that will be utilized at the jobsite.
- 5.3 Each employee is responsible for:
  - 5.3.1 Using safe work practices and understanding how to check the fall protection gear for suitability and proper operation.
  - 5.3.2 Complying with the guidelines as outlined in this document and any additional instructions that they may receive regarding practices or procedures.

## 6.0 GENERAL INSTRUCTIONS:

- 6.1 The Fall Protection Program's intent is to approach a fall hazard in a logical sequence that will best protect the employee from the fall hazard and enable the employee to safely perform the task. There are three fundamental principles to consider when addressing a fall hazard. The first and most desirable approach to consider is elimination. The second is prevention, and the last is controlling falls.
  - 6.1.1 Elimination - This is the first and best line of defense against falls from heights. Elimination requires careful assessment of the workplace and the work itself. Pre-planning of the work and site often not only leads to eliminating the hazard altogether, but also identifies alternative approaches to the work that can measurably enhance productivity. The idea is to design safety into the work process and not simply to try to add safety as an afterthought.
  - 6.1.2 Prevention - Prevention of falls is the second line of defense when fall hazards cannot be eliminated. This also requires assessment of the workplace and work process. It involves making changes to the workplace to preclude the need to rely on the worker's behavior and personal protective equipment to prevent falls. Examples include use of stairs, guardrails, barriers, restraints, and travel restriction systems to prevent the worker from direct and unprotected exposure to the fall hazard. Prevention techniques deal with preventing the fall before onset.

- 6.1.3** Control - Control of falls is the last line of defense. It should be considered only after determining “within reason” that the fall hazard cannot be eliminated or the possibility of falling prevented. This is the domain of fall protection and calls for equipment such as harnesses, lanyards, shock absorbers, fall arrests, self-retracting lifelines, and anchorage connectors. It deals with reducing the risk of injury after the onset of a fall. Fall protection also necessitates assessment and planning of the workplace and work process in order to select the proper equipment, install it, and use it correctly.
- 6.2** Fall protection must be in use whenever an employee has placed him/herself in a position to fall 4 feet or more to a lower level. A Competent Person shall assess the workplace for recognized fall hazards and develop fall prevention/protection strategies to eliminate or reduce employee exposure to falls.
- 6.3** To the extent possible, personnel shall be connected to a suitable anchorage point during the entire work activity, so that fall arrest is continuously provided (100% tie-off).
- 6.4** A personal fall arrest system shall be utilized and attached to an appropriate anchorage for any of the following conditions.
- 6.4.1** When climbing or working on a surface where there is a potential fall hazard of greater than four (4) feet, there are no means to prevent a fall over the edge, such as a restraining device or a guardrail and there is not a designated area (i.e. approved safety warning line system in place.)
- 6.5** Only ANSI-approved full body harnesses shall be used in the Personal Fall Arrest System. Body belts shall not be used for fall arrest.
- 6.6** Personal fall arrest equipment, such as harnesses, lanyards and retractable web lifelines shall be taken out of service any time they are subjected to a fall.
- 6.7** Report all falls and/or near misses to the Supervisor.
- 6.8** Fall protection must be immediately available (worn or “at the elevation”) when working on scaffolding or elevated equipment without Fall Prevention Barriers. It is not intended that people be tied-off while working within the confines of the guardrails of a properly erected scaffold.
- 6.9** A personal fall arrest system is not required when traversing from a properly positioned ladder onto a flat surface such as a roof, unless the ladder is permanently equipped with a fall protection device, such as a vertical ladder climbing safety system.
- 6.10** Elevated Work Platforms (Articulated) - A full-body harness shall be worn with either a four foot long non shock absorbing lanyard or a self-retracting lifeline attached to the appropriate tie-off point in the basket when working from the articulated platform. 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.

- 6.11** Scissor lifts equipped with guardrails do not require workers to use personal fall protection equipment.

**7.0 PERSONAL FALL PROTECTION SYSTEMS:**

When there is a potential fall of 4 feet or more, one or more of the following means of providing protection must be utilized:

**7.1 Guardrail Systems** - Guardrail systems must meet the following criteria. (OSHA subpart D)

- 7.1.1** The top edge height of top rails or (equivalent) guardrails must be 42 inches plus or minus 3 inches above the walking/working level.
- 7.1.2** Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members must be installed between the top edge of the guardrail system and the walking/working surface when there are no walls at least 21 inches high.
- 7.1.3** A standard toe board shall be 4 inches in vertical height from its top edge to the level of the floor, platform, runway, or ramp.
- 7.1.4** 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.

**7.2 Personal Fall Arrest Systems** - These consist of a lanyard, anchorage, connectors, body harness and may include a deceleration device, self-retracting lifeline, or suitable combinations. All personal fall arrest equipment shall meet the requirements of applicable ANSI standards. If a personal fall arrest system is used for fall protection, it must do the following:

- 7.2.1** Limit maximum arresting force on an employee to 1,800 pounds when used with a full body harness.
- 7.2.2** Be rigged so that an employee cannot free fall more than 6-feet or contact with any lower level.
- 7.2.3** The use of body belts for fall arrest is prohibited. A full body harness is required.
- 7.2.4 Lanyards:**

7.2.4.1 Lanyards used for “fall arrest” shall be:

- Attached to the back “D” ring on the safety harness.
- Equipped with an approved shock absorber.
- Adjusted to limit the free fall distance to six (6) feet or contact with any lower level.
- Attached to an approved engineered anchorage.

- Attached preferably to an anchorage above the waist or higher above you.

7.2.4.2 Lanyards used for “fall arrest” should be:

- Selected in the length, which will allow the shortest free fall distance that will allow for unencumbered work.
- Attached directly overhead where possible.

7.2.4.3 Do not tie knots in lanyards used for fall arrest; this could reduce the lanyard’s strength by as much as fifty percent.

7.2.4.4 If approved engineered anchorages are not available, then lanyards used for fall arrest shall be attached to a structural support within the immediate vicinity capable of supporting a load of 5,000 lbs., for each individual attached.

**7.2.5** Anchorage:

7.2.5.1 Anchorage Points 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.

7.2.5.2 Engineered fall protection anchorages shall be clearly identified and designed to meet or exceed the requirements of ANSI standards and OSHA regulations.

7.2.5.3 Engineered anchorages specifically designed for fall arrest shall not be used to lift materials or equipment.

7.2.5.4 Material rigging equipment, such as slings and cables are not approved anchorage connectors.

7.2.5.5 The following may be used as anchorage connectors:

- Approved beam strap or pass thru tie-off adapter
- Approved eyebolt
- D-ring anchorage plate
- Fixed beam anchor
- Sliding beam anchor

7.2.5.6 The following criteria should be addressed when evaluating a non-engineered anchorage:

- The structure supporting the anchorage, such as hangers, angle iron, connecting bolts, etc.
- The type of material the anchorage is constructed of.

7.2.5.7 The following list is an example of structures/equipment, which are unacceptable as anchorages for “fall arrest.”

- Electrical conduit, cable trays
- Instrument lines
- PVC piping
- Equipment that could move, such as a mobile crane.
- Piping or ducts

**7.2.6** Self-Retracting Lifeline:

7.2.6.1 Self-Retracting Lifelines shall be:

- Attached to the back “D” ring of a body harness.
- Attached by an anchorage connector to an appropriate anchorage point (see 6.2.5)
- Used by personnel who have a combined weight (clothes, tools, individual) of at least 75 pounds and a maximum of 310 pounds (or matched to actual combined weight with a rated Self-Retracting Lifeline from a recognized manufacturer).

7.2.6.2 Self-Retracting Lifelines shall **not** be lengthened by attaching lanyards or other components.

7.2.6.3 The Self-Retracting Lifeline shall not be allowed to pass underneath arms or between legs. This action could lead to serious injury.

7.2.6.4 Avoid exposure of SRL to:

- Corrosive materials
- Acids
- Caustics
- Excessive heat

**7.3** Covers - Covers located in roadways and vehicular aisles must be able to support at least twice the maximum axle load of the largest vehicle to which the cover might be subjected.

**7.3.1** All other covers must be able to support at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

**7.3.2** To prevent accidental displacement resulting from wind, equipment, or workers activities, all covers must be secured.

**7.3.3** All covers shall be marked with a contrasting color or bear the markings "HOLE" or "COVER."

**7.4** Protection from Falling Objects- Toeboards, when used for general falling object protection (tools, materials, etc.), shall be erected along the edge of the overhead walking / working surface for a distance sufficient to protect employees below. Toeboards shall be a minimum of 4-inches in vertical height from their top edge to the level of the walking/working surface.

**7.5** In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the Director of Safety or designee(s) shall investigate the circumstances of the fall or other incident to determine if the fall protection program needs to be changed (e.g. new practices, procedures, or training). Corrective measures shall be implemented to prevent similar types of falls or incidents. (refer to Policy)

## **8.0 TRAINING:**

**8.1** Competent Person training shall be provided by a Qualified person and/or another documented competent person.

**8.2** Training shall be provided by a competent person, for personnel who may be exposed to fall hazards.

**8.3** Training shall include:

**8.3.1** The nature of fall hazards in the particular environment.

**8.3.2** The procedures for using, maintaining, and inspecting the fall protection systems to be used.

**8.3.3** The procedures for handling and storing fall protection equipment.

**8.3.4** Applicable ANSI and OSHA Standards pertaining to fall protection.

**8.4** Retraining shall be conducted when:

**8.4.1** Changes in the workplace render previous training obsolete.

**8.4.2** Changes in the type of fall protection systems used renders previous training obsolete.

**8.4.3** Inadequacies in employee's knowledge or use of fall protection systems indicate that the employee has not retained the required understanding or skill.

**8.5** Training attendance records shall contain the name or other identity of the employee, the date of the training, and the signature of the person or employer who conducted the training.

**8.6** Training records shall maintained for the duration of employment.



## **9.0 RECORDKEEPING**

**9.1** The following records will be maintained by EHRS:

- 9.1.1 Training Records.
- 9.1.2 Annual inspection reports of Fall Protection equipment.
- 9.1.3 Other Records as needed.