

# **Fall Protection Program**

## **Purpose**

The purpose of this program is to provide procedures to eliminate, prevent, and control hazards from falls from heights. It also establishes safe work practices when working at height. This program prescribes the duty to provide fall protection; sets the criteria and practices for fall protection; and outlines required training and recordkeeping. The use of ladders, scaffolds and aerial lifts are not covered in detail within this program. Refer to the Elevated Work Platform program for information regarding these topics.

## **Definitions**

- **Anchorage**: a secure point of attachment for equipment such as lifelines, lanyards, or deceleration devices.
- **Body belt**: a strap with means both for securing about the waist and for attaching to other components such as a lanyard used with positioning systems.
- **Body harness**: straps that secure about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders, with a means for attaching the harness to other components of a personal fall protection system.
- **Competent Person**: Employees designated at the Working Unit level responsible for the oversight, implementation and management of the Fall Protection Program.
- **Connector**: a device used to couple (connect) parts of the fall protection system together.
- **Deceleration device**: any mechanism, such as automatic self-retracting lifelines/lanyards, that serves to dissipate energy during a fall.
- **Deceleration distance**: the vertical distance a falling employee travels from the point at which the deceleration device begins to operate, excluding lifeline elongation and free fall distance, until stopping.
- **Designated area**: a space which has a perimeter barrier erected to warn employees when they approach an unprotected side or edge and serves also to designate an area where work may be performed without additional fall protection.
- **Fall protection**: any equipment, device, or system that prevents an employee from falling from an elevation or mitigates the effect of such a fall. Fall protection must be used whenever an employee has the potential to fall 4 feet or more to a lower level and there are no means to prevent a fall.
- **Free fall distance**: the vertical fall distance before the fall arrest system takes effect.
- **Guardrail system**: a barrier erected to prevent employees from falling to a lower level.
- **Hole**: a gap or void in a floor, roof, or other walking-working surface.

- **IBC**: International Building Code – latest adopted version by Pennsylvania Department of Labor and Industry.
- **Lanyard**: a line used to secure a body harness to a deceleration device, lifeline, or anchorage.
- **Ladder Safety System**: A fall protection option that is permanently attached to a fixed ladder, immediately adjacent to the ladder. The system is designed to eliminate or reduce the possibility of falling from a ladder. Ladder safety systems must be installed on all new or replacement fixed ladders that extend greater than 24 feet above a lower level.
- **Lifeline**: 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**: a roof that has a slope less than or equal to 10 degrees.
- **Lower level**: a surface or area to which an employee can fall. Such surfaces or areas include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, or tanks.
- **Opening**: a gap or open space through which an employee can fall to a lower level.
- **Personal Fall Arrest System (PFAS)**: a system used to arrest an employee in a fall from a walking-working surface. It consists of a body harness, anchorage, and connector. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these.
- **Qualified Person**: a person who, by possession of a recognized degree, certificate, or professional standing, 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/lanyard**: 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.
- **Snap hook**: 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. The use of a non-locking snaphook as part of personal fall arrest systems is prohibited.
- **Toeboard**: a low protective barrier that is designed to prevent materials, tools, and equipment from falling to a lower level, and protect employees from falling.

- **Travel restraint system**: a protective system that prevents employees from reaching an edge where a fall is possible. The restraint is generally a line from an anchorage to which the employee is secured in such a way as to prevent the employee from walking or falling off an elevated work surface. A “traveling restraint system” would refer to a line between two anchorages that would enable the employee to attach to that line yet limit travel in such a manner as to prevent exposure to a fall hazard. Travel restraint systems must be used such that they do not support any portion of the employee's weight and freely travel between the anchorages while preventing the possibility of a fall.
- **Unprotected sides and edges**: any side or edge of a walking-working surface where there is no wall, guardrail, or stair rail system to protect an employee from falling to a lower level.
- **Walking-working surface**: any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area or workplace location.

## Responsibilities

### Environmental Health & Radiation Safety (EHRS)

- Ensures implementation and compliance with this program.
- Audits departmental program periodically.
- Assists in the assessment of work practices and workplaces to determine how fall hazards can be eliminated, prevented, and controlled.

### Project Delivery Group (PDG)

- Ensures all new construction and renovations, where applicable, include an engineered fall protection component. The preferred methods of fall protection are:
  - A parapet (equal to or greater than 42 inches, plus or minus 3 inches) along the perimeter of work areas on rooftops.
  - A 42-inch, plus or minus 3 inches, guardrail around the perimeter of the roof.
  - A fall protection system where fall hazards exist and are not protected by a parapet or guardrail.

### Working Unit (Facilities Management, Service Operations, Library, etc.)

- Comply with the requirements outlined in this program.
- Has identified at least one Competent Person within the Working Unit.

- Ensure that working surfaces are inspected, regularly and as necessary, and maintained in a safe condition.
- Ensure, through training, employees can identify existing or predictable hazards and are authorized to take corrective measures to eliminate hazards.
- Maintain documentation of fall protection equipment inspections.
- Maintain records of fall protection training.
- Ensure employees who conduct work from elevated surfaces are trained in fall protection practices.
- Assess work practices and workplaces to determine how fall hazards can be eliminated, prevented, and controlled.
- Understand the job hazards, limitations of fall protection equipment, and rescue procedures.
- Ensure that fall protection equipment is available and in safe working condition.
- Plan for emergency rescue in the event of a fall.
- Ensure that fall protection equipment is inspected prior to use and report defective equipment immediately to their supervisor or manager.

### **Competent Person**

- Conducts hazard surveys to identify fall hazards before employees are exposed to fall hazards and, when needed, stops work immediately if it is determined unsafe to proceed.
- Prepares, updates, and reviews written fall protection procedures and ensures a written rescue plan is developed.
- Specifies, in written fall protection procedures, the systems in place to include anchorage points, connecting means, and other fall protection equipment that employees are required to use when exposed to a fall hazard.
- Verify the fall protection systems are installed and inspected in compliance with this program and applicable standards.
- Verify and ensure all employees working at height are trained and authorized to do so.
- Immediately remove from service any fall protection equipment found defective or subjected to forces as a result of a fall from elevated work.
- Inspect fall protection equipment as recommended by the manufacturer and specified in this program and ensure inspections by qualified persons are conducted as required.

## Design and Installation

The following are minimum design and installation criteria for fall protection at Temple University:

### Guardrail Systems

- Every open-sided floor or platform 4 feet or more above a lower level shall be guarded by a standard railing on all open sides except where there is entrance to a ramp, stairway, or fixed ladder. New construction will be designed to the latest IBC standard.
- A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a minimum vertical height of 42 inches, plus or minus 3 inches, from the upper surface of the top rail to floor, platform, runway, or ramp level.
- For wood railings, the posts shall be of at least 2-inch by 4-inch stock spaced not to exceed 6 feet between posts; the top and intermediate rails shall be of at least 2-inch by 4-inch stock. If the top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.
- For pipe railings, posts and top and intermediate railings shall be at least 1 1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
- For structural steel railings, posts and top and intermediate rails shall be of 2-inch by 2-inch by 3/8-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.
- 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.
- If intermediate vertical members (such as balusters) are used, they will be installed no more than 19 inches apart; and other equivalent intermediate members (such as additional midrails and architectural panels) will be installed so that the openings are not more than 19 inches wide.
- 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.
- The top rail shall be smooth surfaced throughout the length of the railing. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.
- The railing shall be provided with a toeboard wherever, beneath the open sides, persons can pass, there is moving machinery below, or there is equipment with which falling materials could create a hazard.
- A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more

than ¼ inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension. It shall be capable of withstanding, without failure, a force of at least 50 pounds applied in any downward or outward direction at any point along the toeboard.

- Guardrail systems may be temporary and erected for specific tasks. They must meet the same height and performance requirements as permanent guardrails.
- Guardrail height must be adjusted to accommodate the height of stilts, if they are in use.

## **Covers**

Covers used to cover holes, including skylights, must:

- Be capable of supporting without failure, at least twice the maximum intended load that may be imposed on the cover at any one time, including employees, equipment, and materials.
- Be secured to prevent accidental displacement.
- Be labeled as “hole” or “cover”.

## **Ladder Safety Systems**

- Must allow the employee to climb up and down the ladder using both hands.
- The connection between the carrier/lifeline and point of attachment to the body harness or belt does not exceed 9 inches.
- The design and installation of the mountings and cable guides does not reduce the design strength of the ladder.

## **Ladder Cages and Wells**

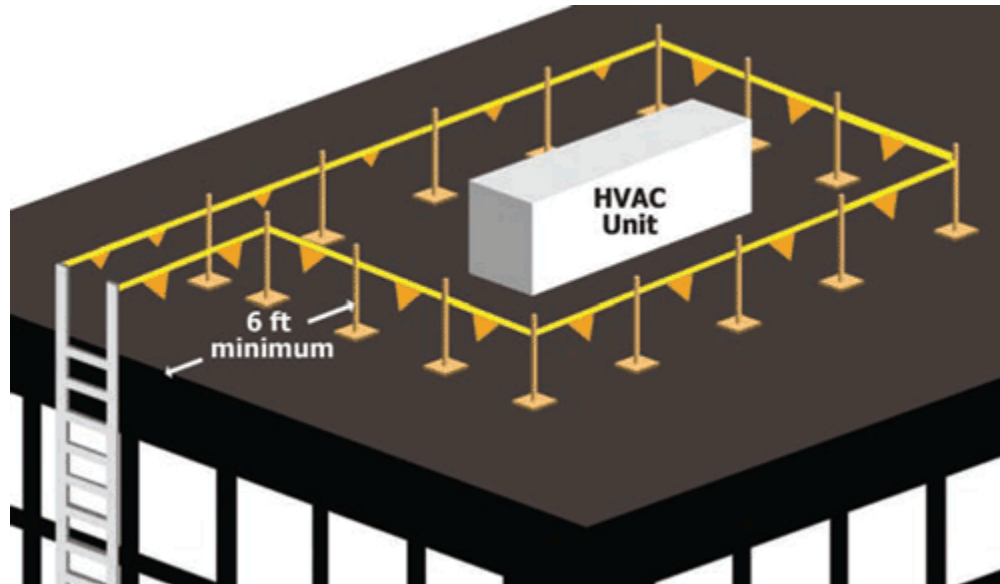
- Permit easy access to and egress from the ladder.
- Contain employees in the event of a fall.
- Direct employees to a lower landing.
- Cages and wells will not be installed on new or replacement fixed ladders that extend more than 24 feet above a lower level. These ladders will use a ladder safety system or personal fall arrest system.

## **Designated Areas**

Designated areas, which comply with the requirements of this paragraph, may be established as an alternative to installing guardrails and where a Competent Person demonstrates that

employees within the designated areas are not exposed to fall hazards. In addition, the following conditions and requirements must be met in order to use designated areas in lieu of other fall protection measures:

- The work must be both **temporary and infrequent**, such as maintenance on roof top equipment and performed **at least six feet** from the unprotected edge.
- Designated areas shall be established only on low-sloping roofs.
- The designated area shall consist of an area surrounded by a rope, wire or chain and supporting stanchions erected in accordance with the following criteria:
  - Strength:
    - After being erected with the line (such as 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. The force shall be applied 30 inches above the work surface and perpendicular to the designated area perimeter, and in the direction of the unprotected side or edge;
    - The line shall have a minimum breaking or tensile strength of 500 pounds, and after being attached to the stanchions, shall be capable of supporting the loads applied without breaking; and
    - 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.
  - Height: The line shall be installed in such a manner that its lowest point (including sag) is no less than 34 inches nor more than 39 inches from the work surface.
  - Visibility: The line forming the designated area shall be clearly visible from any unobstructed location within the designated area up to 25 feet away, or at the maximum distance an employee may be positioned away from the line, whichever is less. (One method for meeting the visibility criteria for designated areas is to place a flag made of high visibility material on the rope, or wire or chain at not more than six foot intervals.)
  - Location:
    - The stanchions shall be erected as close to the work area as is permitted by the task.
    - The perimeter of the designated area shall be **no less than six feet from the unprotected side or edge**.
    - Access to the designated area shall be by a clear path, formed by two lines, attached to stanchions, which meet the strength, height and visibility requirements of this paragraph.



*Figure 1- Designated Area (courtesy of eLCOSH)*

## Travel Restraint Systems

Where employees must work at an elevated working surface while exposed to fall hazards and a guardrail system isn't feasible, a travel restraint system is the first option considered to protect employees. A travel restraint is arranged to not allow the employee to reach the edge where a fall is possible. Travel restraint systems require:

- A Competent Person to assess the work area to ensure that a travel restraint system is feasible and to assist the employee in designating a suitable anchor point and system components.
- The connecting lanyard must be adjusted to a length that will not allow the employee to reach the edge where a free fall is possible.
- Restraint lines in the system must be capable of sustaining a tensile load of at least 5000 pounds.
- A full-body harness must be used in a travel restraint system.
- An anchor system that is rated to at least 5000 pounds.

Direct supervision of employees using travel restraint systems is critical to ensure that lanyards and lifelines are adjusted properly.



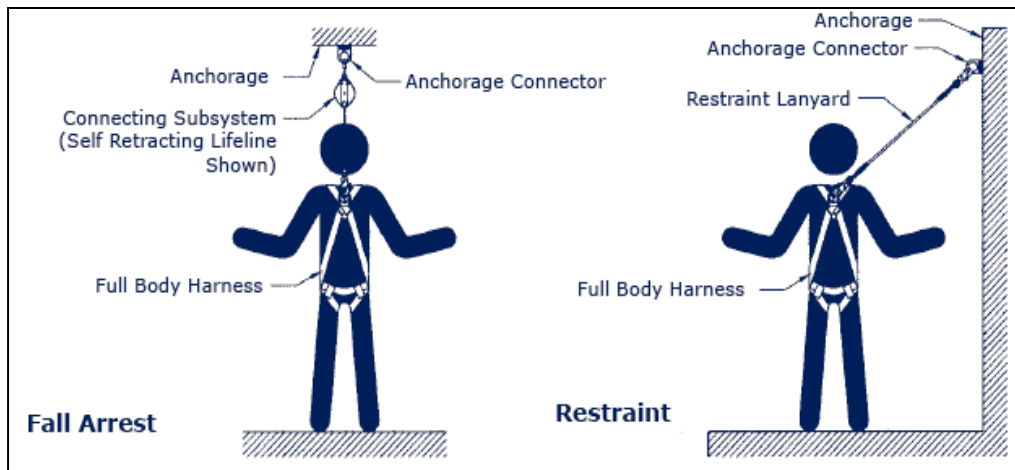


Figure 2- Fall Arrest vs. Travel Restraint (courtesy of UVA)

## Personal Fall Arrest Systems (PFAS)

Where employees must work at an elevated working surface, exposed to fall hazards, where a free fall is possible and either a guardrail, or a travel restraint system is not feasible:

- A full-body harness, approved connector, and engineered anchor point must be used.
- All PFAS components shall be compatible with each other.
- All PFAS equipment shall meet applicable ANSI standards and OSHA regulations.
- All PFAS equipment shall be used as per the manufacturer.
- The PFAS shall not allow a falling employee to free fall more than 6 feet or strike a lower level and limit the maximum deceleration distance to 3.5 feet.
- The maximum arresting force on the employee may only be up to 1,800 pounds.
- All snap hooks shall be double locking, thereby not allowing pressure to be applied to the gate in the opening direction.
- Snap hooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snap hook. Only a locking type snap hook designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member shall be used.
- 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.
- Non-shock absorbing lanyards shall not be used for fall arrest.
- Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds. Where vertical lifelines are used, each employee shall be attached to a separate lifeline.
- Lifelines shall be protected against being cut or abraded.

- 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.
- 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 part of a complete personal fall arrest system which maintains a safety factor of at least two.
- The anchor point should be overhead and as close as possible to reduce fall arresting forces in the event a fall should occur.
- Avoid anchor points where a fall may result in a pendulum motion that could cause serious injury (aka swing-fall).
- Systems used by an employee having a combined person and tool weight in excess of 310 pounds shall be modified to provide proper protection for such heavier loads.
- The attachment point of the connecting lanyard to the full-body harness shall be located in the center of the wearer's back near shoulder level.
- Fall protection equipment shall be utilized for employee protection only and should not be used for any other use. For example, fall protection equipment should never be used as hoisting slings, tow ropes, etc.
- PFAS and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection.
- PFAS shall properly fit each employee to ensure that the system is capable of keeping the employee within the system or strap configuration without contacting the neck or chin area.
- PFAS shall not be attached to guardrail systems.

## **PFAS Storage and Inspections**

### *Storage*

A dedicated storage area shall be provided for the storage of fall protection equipment and all components. The storage area shall keep the equipment clean, dry, and free from oils, chemicals, paints, and excessive heat.

### *Inspections*

Fall protection equipment shall be inspected before each use for wear, damage, other deterioration, or other defects as per the manufacturer. The manufacturer's instructions for inspecting equipment shall be followed. The *PFAS Inspection* sheet may be used in combination with manufacturer's instructions.

Additionally, all fall protection equipment subjected to impact loading shall be promptly removed from service.

## **Work Practices**

### **Protection from Falling Objects**

When employees are required to work in proximity of others working with materials, tools, or equipment at elevated levels, barricades shall be erected around the immediate area of the overhead work to prohibit employees and pedestrians from entering the area where they could be exposed to overhead hazards.

Employees performing work at elevated levels shall keep tools, materials, and equipment away from the edge to keep potential objects from falling over the side. Where practical, tools, etc. shall be secured with rope, wire, etc. to keep them from falling.

Toeboards must be installed on all scaffolds and guard rail systems where employees or pedestrian are exposed to overhead hazards. Do not allow tools, equipment, or materials to pile higher than the toe board.

Employees with potential for injury to the head from falling objects must wear head protection (hard hats).

### **Rooftop Work**

If the building is equipped with guardrails, a parapet, or other barriers that extend at least 42 inches, plus or minus 3 inches, above the roof and provide a protective barrier between the employee and fall hazards, then the fall hazard has been eliminated and no further action or equipment is needed.

If the building is not equipped with features that protect employees from falls from the roof, the following elements must be in place to ensure employee rooftop safety:

- Perform a hazard assessment prior to each roof entry that includes a description of the work to be completed, the path from the roof access point to the work area, and the protective devices to be used.
- Limit access to the roof to only trained employees who are capable of recognizing, evaluating and controlling fall hazards.

Options for protective devices for rooftop work include:

- Portable Guardrails
- Fall Restraint/Prevention Systems OR
- Personal Fall Arrest Systems

Roof hatches when left open, constitute a fall hazard. To eliminate the fall hazard, roof hatches must be kept closed while the work is underway unless the hatch opening is protected by guardrails.

Skylights also represent a fall hazard. When working on or in proximity of skylights, either the skylights must be effectively covered, protected with permanent or temporary guardrails or employees must wear a restraint system or PFAS.

Work performed 15 feet or more from the roofs edge on a low-sloping roof must use conventional fall protection (i.e., personal fall protection systems or designated areas) unless the work is temporary and infrequent. **If the work is 15 feet or more from the roofs edge and both temporary and infrequent conventional fall protection is not necessary.**

## **Rescue/Retrieval**

The Supervisor or Competent Person shall plan for the prompt rescue of employees in the event of a fall or ensure that employees are able to rescue themselves.

Prior to the beginning of each elevated work assignment, the Supervisor or Competent Person shall evaluate and plan for the prompt identification and rescue of employees involved in a fall.

The Rescue/Retrieval Plan should include options such as the use of trained rescue personnel, ladders, mechanical devices with descent capability, and devices that allow suspended workers to maintain circulation in their legs while they are awaiting rescue, such as trauma straps.

## **Incident Investigations**

The Supervisor or Competent Person shall conduct an incident investigation in the event of a fall, near miss or other serious incident. The incident investigations will include an evaluation of both the fall protection plan and the execution of that plan for potential improvements to practices, procedures or training in order to prevent reoccurrence.

Any corrective actions generated as a result of the incident investigation shall be implemented immediately. Retraining for all employees will be conducted as needed.

## Training

Before any employee is exposed to a fall hazard, training shall be provided by a qualified person.

Training shall include:

- The nature of the fall hazards in the work area and how to recognize and minimize them.
- The procedures for installing, inspecting, operating, maintaining, disassembling, and storing the personal fall protection systems.
- Rescue/retrieval options.
- Applicable OSHA regulations and ANSI standards.

Training records will be maintained by the Working Unit. The records shall contain:

- The name of the employees trained.
- The dates of training.
- The name and signature of the person who conducted the training.

Retraining shall be conducted when:

- Changes in the workplace render previous training obsolete or inadequate.
- Changes in the types of fall protection systems or equipment to be used render previous training obsolete or inadequate.

Inadequacies in an employee's knowledge or use of fall protection systems or equipment indicate that the employee no longer has the requisite understanding or skill necessary to perform the job safely.

## References

- [29 CFR 1910 Subpart D](#)
- [29 CFR 1910.140](#)
- [IBC – 2015 \(or latest adopted version\) – Section 1015 – Guards](#)
- [IBC – 2015 \(or latest adopted version\) – Section 3300 – Safeguards During Construction](#)