

<b>Title:</b> Fall Protection Program	<b>Document No.:</b> OCS-402
	<b>Revision No.:</b> 01 <b>Date:</b> March 9, 2017
	<b>Approved By:</b> Avraham Boruchowitz, CSP, CHMM

## 1.0 Introduction

It is the goal of Radford University to protect all faculty, staff, and students from injuries caused by falls on campus. With this in mind, Environmental Health and Safety (EHS) developed this Fall Protection Program to assist the University in maintaining the safety of all persons working at heights at Radford University. Furthermore, this program was designed to be in compliance with 29 CFR 1910 Subpart D, 29 CFR 1910.140, 29 CFR 1926 Subpart L, and 29 CFR 1926 Subpart M.

## 2.0 Scope

This program applies to all faculty, staff, and students of Radford University. Requirements for fall protection, training, and inspecting equipment are outlined within this program.

The requirements for fall protection that are set forth in this program do not apply:

- When employers are inspecting, investigating, or assessing workplace conditions or work to be performed prior to the start of work or after all work has been completed. This exemption does not apply when fall protection systems or equipment meeting the requirements of 29 CFR 1910.29 have been installed and are available for workers to use for pre-work and post-work inspections, investigations, or assessments;
- To portable ladders; and
- To aerial lifts covered by OCS-102 Aerial Lift and Elevating Work Platform Safety Program.

## 3.0 Definitions

Anchorage or Anchor Point – A secure point of attachment for lifelines, lanyards, or deceleration (grabbing) devices.

Body Belt (Safety Belt) – A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device. The use of body belts at Radford University is prohibited.

Authorized – An employee who the employer assigns to perform a specific type of duty, or allows in a specific location or area.

Cage – An enclosure mounted on the side rails of a fixed ladder or fastened to a structure behind the fixed ladder that is designed to surround the climbing space of the ladder. A cage also is called a "cage guard" or "basket guard."

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Combination ladder – A portable ladder that can be used as a stepladder, extension ladder, trestle ladder, or stairway ladder. The components of a combination ladder also may be used separately as a single ladder.

Competent Person/Individual – Person capable of identifying existing and potential hazards in the work environment. Persons/individuals are deemed competent through a combination of training and hands-on experiences to possess knowledge about all aspects of the fall protection program and fall protection equipment.

Connector/Connection Device – A device that is used to couple (connect) parts of a personal fall arrest system or positioning device system together.

Controlled access zone (CAZ) – An area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

Dangerous equipment – Equipment, such as vats, tanks, electrical equipment, machinery, equipment or machinery with protruding parts, or other similar units, that, because of their function or form, may harm an employee who falls into or onto the equipment.

Deceleration Device – Any mechanism, such as a rope, grabbing device, rip stitch lanyard, specially woven lanyard or automatic self-retracting lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on a person during fall arrest.

Deceleration Distance – The additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Designated area – A distinct portion of a walking-working surface delineated by a warning line in which employees may perform work without additional fall protection.

Extension ladder – A non-self-supporting portable ladder that is adjustable in length.

Failure – A load refusal, breakage, or separation of component parts. A load refusal is the point at which the ultimate strength of a component or object is exceeded.

Fall hazard – Any condition on a walking-working surface that exposes an employee to a risk of harm from a fall on the same level or to a lower level.

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Fall protection – Any equipment, device, or system that prevents an employee from falling from an elevation or mitigates the effect of such a fall.

Fixed ladder – A ladder with rails or individual rungs that is permanently attached to a structure, building, or equipment. Fixed ladders include individual-rung ladders, but not ship stairs, step bolts, or manhole steps.

Free Fall – The act of falling before a personal fall arrest system begins to apply forces to arrest the fall.

Full Body Harness – An interconnected set of straps that may be secured about a person in a manner that distributes 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 arrest system.

Grab bar – An individual horizontal or vertical handhold installed to provide access above the height of the ladder.

Guardrail system – A barrier at least 42 inches high which includes posts, a mid-rail, and toe boards if required, erected along an unprotected or exposed side, edge, or other area of a walking working surface to prevent employees from falling to a lower level.

Handrail – A rail used to provide employees with a handhold for support.

Hole – A gap or void in a floor, roof, horizontal walking-working surface, or similar surface that is at least 2 inches (5.1 cm) or more in its least dimension.

Individual-rung ladder – A ladder that has rungs individually attached to a building or structure. An individual-rung ladder does not include manhole steps.

Ladder – A device with rungs, steps, or cleats used to gain access to a different elevation.

Ladder safety system – A system designed to eliminate or reduce the possibility of falling from a ladder. A ladder safety system usually consists of a carrier, safety sleeve, lanyard, connectors, and body harness. Cages and wells are not ladder safety systems.

Lanyard – A flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body harness to a deceleration device, lifeline, or anchorage.

Lifeline – A component consisting of a flexible line for connecting to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorage at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components

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of a personal fall arrest system to the anchorage. Lifelines should have a breaking strength of 5000 pounds.

Low-slope roof – A roof that has a slope less than or equal to a ratio of 4 in 12 (vertical to horizontal).

Lower level – A surface or area to which an employee could fall. Such surfaces or areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, materials, water, equipment, and similar surfaces and structures, or portions thereof.

Maximum intended load – The total load (weight and force) of all employees, equipment, vehicles, tools, materials, and other loads the employer reasonably anticipates to be applied to a walking-working surface at any one time.

Mechanical Equipment – All motor or human propelled wheeled equipment used for roofing work, except, wheelbarrows and mop carts.

Mobile – Manually propelled or moveable.

Mobile ladder stand (ladder stand) – A mobile, fixed-height, self-supporting ladder that usually consists of wheels or casters on a rigid base and steps leading to a top step. A mobile ladder stand also may have handrails and is designed for use by one employee at a time.

Mobile ladder stand platform – A mobile, fixed-height, self-supporting unit having one or more standing platforms that are provided with means of access or egress.

Open riser – The gap or space between treads of stairways that do not have upright or inclined members (risers).

Opening – A gap or void in a wall, partition, vertical walking working surface, or similar surface that is at least 30 inches (76 cm) high and at least 18 inches (46 cm) wide, through which a person can fall to a lower level.

Personal Fall Arrest System – A system (including all components) used to arrest an employee in a fall from a working level. It consist of an anchorage, connectors, a body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these. Fall arrest systems are engineered to be compatible between the permanent system and the personal protective equipment. Interchanging the components is not permitted. The system prevents falling for more than 6-feet to avoid hitting lower surfaces. Each person must be attached to their own lifeline with only one (1) person on each lifeline. The anchorage point must be able to support at least 5000 pounds per employee. *As of January 1, 1998, the use of a body belt for fall arrest is prohibited.*

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Personal Fall Protection System – A system (including all components) an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs. Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.

Personal Fall Restraint System – A fall protection system composed of body belts or harnesses attached to a life-line. The system consists of an anchorage, connectors, and body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. The anchorage base must support four (4) times the intended load and be rigged to allow the movement of the employee only as far as the edges of the working area.

Platform – A walking-working surface that is elevated above the surrounding area.

Portable ladder – A ladder that can readily be moved or carried, and usually consists of side rails joined at intervals by steps, rungs, or cleats.

Positioning Device System – A 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.

Qualified Person – A person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience in the fall protection field and has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project.

Ramp – An inclined walking working surface used to access another level.

Riser – The upright (vertical) or inclined member of a stair that is located at the back of a stair tread or platform and connects close to the front edge of the next higher tread, platform, or landing.

Roof – The exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily becomes the top surface of a building.

Rung, step, or cleat – The crosspiece of a ladder on which an employee steps to climb up and down.

Runway – An elevated walking working surface, such as a catwalk, a foot walk along shafting, or an elevated walkway between buildings.

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Safety-monitoring system – A safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Scaffold – Any temporary elevated or suspended platform and its supporting structure, including anchorage points, used to support employees, equipment, materials, and other items. For purposes of this subpart, a scaffold does not include a crane-suspended or derrick-suspended personnel platform or a rope descent system.

Self-Retracting Lifeline (SRL) – A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under minimal tension during normal movement and which, after onset of a fall, automatically locks the drum and arrests the fall (usually within 2-feet or less.)

Ship stair (ship ladder) – A stairway that is equipped with treads, stair rails, and open risers, and has a slope that is between 50 and 70 degrees from the horizontal.

Side-step ladder – A type of fixed ladder that requires an employee to step sideways from it in order to reach a walking-working surface, such as a landing.

Snaphooks – A connector consisting 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. Only locking snap hooks are permitted to be utilized.

Spiral stairs – A series of treads attached to a vertical pole in a winding fashion, usually within a cylindrical space.

Stair rail or stair rail system – A barrier erected along the exposed or open side of stairways to prevent employees from falling to a lower level.

Stairway (stairs) – Risers and treads that connect one level with another, and includes any landings and platforms in between those levels. Stairways include standard, spiral, alternating tread-type, and ship stairs.

Standard stairs – A fixed or permanently installed stairway. Ship, spiral, and alternating tread-type stairs are not considered standard stairs.

Stepladder – A self-supporting, portable ladder that has a fixed height, flat steps, and a hinged back.

Stepstool – A self-supporting, portable ladder that has flat steps and side rails. For purposes of the final rule, stepstool includes only those ladders that have a fixed height, do not have a pail

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shelf, and do not exceed 32 inches (81 cm) in overall height to the top cap, although side rails may extend above the top cap. A stepstool is designed so an employee can climb and stand on all of the steps and the top cap.

Steep Roof – A roof having a slope greater than 4 in 12 (vertical to horizontal.)

Through ladder – A type of fixed ladder that allows the employee to step through the side rails at the top of the ladder to reach a walking-working surface, such as a landing.

Tie-Off – A procedure of connecting directly or indirectly to an anchorage point using an approved connection device (i.e. strap, lanyard, etc.)

Toe Board – The lowest protective barrier of a guardrail system that prevents material and equipment from falling off of the working surface to lower levels.

Travel restraint system – A combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employer uses to eliminate the possibility of an employee going over the edge of a walking-working surface.

Tread – A horizontal member of a stair or stairway, but does not include landings or platforms

Unprotected sides and edges – Any side or edge of a walking-working surface (except at entrances and other points of access) where there is no wall, guardrail system, 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 including, but not limited to, floors, roofs, ramps, bridges, and runways.

Warning line – A barrier erected to warn employees that they are approaching an unprotected side or edge, and which designates an area in which work may take place without the use of other means of fall protection.

Well – A permanent, complete enclosure around a fixed ladder.

#### **4.0 Responsibilities**

##### Department/Supervisor Responsibilities

- Ensure that all Authorized Employees (including new and transferred employees) are trained in the safety significance, purpose, and use of fall protection.
- Recognize potential fall hazards based on this program.



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- Ensure all Authorized Employees receive the appropriate level of training and that these employees are provided with the proper equipment and personal protective equipment (PPE) to perform the job safely.
- Notify EHS of the need for appropriate training such as ladder safety, scaffolding safety, and personal fall arrest system safety.
- Evaluate, on an annual basis, the effectiveness of the program as it applies to the work conducted by the department.
- Contact EHS for technical support when questions arise regarding compliance and safe procedures.
- Ensure that proper safety equipment is supplied to their Authorized Employees where needed, such as fall arrest systems, scaffolding, proper ladders, guard railings, toe kicks, etc.
- Ensure that all work places are safe to perform the work that their Authorized Employees are expected to conduct. This includes, but is not limited to, prevention of slipping, tripping, and falling. All locations where fall hazards are present must be kept clean, dry (where possible), and orderly. Where wet processes are used, drainage will be maintained and false floors, mats, or other dry standing places are provided where practical.

### Authorized Employees

- Attend EHS Fall protection training and to use work practices developed in accordance with this program to prevent injuries that could result from a fall to the same or lower level.
- Attend refresher training every three years, or due to incident, observation of unsafe work practices, update of requirements, or changes to operating guidelines.
- Adhere to the written building specific fall protection procedures for the rooftop being worked on. If no written procedure exists the employee shall notify their supervisor and EHS. Work should not be performed until a reviewed written procedure is in place.

### Environmental Health and Safety (EHS)

EHS provides program oversight and is responsible for developing, implementing, and administering the Fall Protection Program. These responsibilities include:

- Assisting Facilities Management and other departments on campus who perform work at heights to interpret the standards and regulations as they apply to the work being performed.
- Assessing all buildings and rooftops on campus to develop a written fall protection procedure for each building.



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- Training all Authorized Employees in the associated hazards, general safe work practices, and program requirements.
- Maintaining centralized records of training, inspection data, and reports.
- Conducting an annual review of each department that conducts work within the scope of this program.

## **5.0 Protection From Fall Hazards**

### Unprotected sides and edges

Each employee on a walking-working surface with an unprotected side or edge that is 4 feet or more above a lower level is protected from falling by one or more of the following:

- Guardrail systems;
- Safety net systems; or
- Personal fall protection systems, such as:
  - Personal fall arrest;
  - Travel restraint; or
  - Positioning systems.

In the event that it is not feasible or creates a greater hazard to use any of the above listed forms of fall protection, a fall protection plan that complies with 29 CFR 1926.502(k) will be developed for that specific event in lieu of implementing any of the above systems.

### Holes

Each employee is protected from falling through any hole (including skylights) that is 4 feet or more above a lower level by one or more of the following:

- Covers;
- Guardrail systems;
- Travel restraint systems; or
- Personal fall arrest systems.

### Runways and similar walkways

Each employee on a runway or similar walkway is protected from falling 4 feet or more to a lower level by a guardrail system. When it is demonstrated that it is not feasible to have

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guardrails on both sides of a runway used exclusively for a special purpose, the employer may omit the guardrail on one side of the runway, provided the employer ensures:

- The runway is at least 18 inches wide; and
- Each employee is provided with and uses a:
  - Personal fall arrest system; or
  - Travel restraint system.

Dangerous equipment

Each employee less than 4 feet above dangerous equipment is protected from falling into or onto the dangerous equipment by a guardrail system or a travel restraint system, unless the equipment is covered or guarded to eliminate the hazard.

Each employee 4 feet (1.2 m) or more above dangerous equipment must be protected from falling by:

- Guardrail systems;
- Safety net systems;
- Travel restraint systems; or
- Personal fall arrest systems.

Openings

Each employee on a walking-working surface near an opening, including one with a chute attached, where the inside bottom edge of the opening is less than 39 inches above that walking-working surface and the outside bottom edge of the opening is 4 feet or more above a lower level is protected from falling by the use of:

- Guardrail systems;
- Safety net systems;
- Travel restraint systems; or
- Personal fall arrest systems.

Fixed Ladders that extend more than 24 feet above a lower level

Each fixed ladder shall be equipped with a:

- Personal fall arrest system; or

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- Ladder safety system

The use of a cage or well in combination with the above listed fall protection systems is permitted as long as the cage or well does not interfere with the operation of the system.

*Note: Existing fixed ladders installed before November 19, 2018 are permitted to have a cage or well as the only form of fall protection until November 18, 2036, at which time all fixed ladders shall be equipped with a personal fall arrest system or ladder safety system.*

### Stairways

Each employee exposed to an unprotected side or edge of a stairway landing that is 4 feet (6 feet for Construction) or more above a lower level is protected by a guardrail or stair rail system. Ship stairs and alternating tread type stairs shall be equipped with handrails on both sides.

All stairs shall have tread and risers that are in good repair with adequate headroom maintained above. Stairs must be kept clear of clutter and other slippery materials.

### Scaffolds

Each employee on a scaffold more than 10 feet above a lower level shall be protected from falling to that lower level. All employees who erect or use scaffolding shall be properly trained prior to working with or on scaffolding. The required fall protection systems are dependent on the type of scaffolding being used.

Each employee on a boatswains' chair, catenary scaffold, float scaffold, needle beam scaffold, or ladder jack scaffold shall be protected by:

- Personal fall arrest systems.

Each employee on a single-point or two-point adjustable suspension scaffold shall be protected by:

- Personal fall arrest systems; and
- Guardrail systems.

Each employee on a crawling board (chicken ladder) shall be protected by:

- Personal fall arrest systems;

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- Guardrail systems (with minimum 200 pound top rail capacity); or
- A three-fourth inch diameter grab line or equivalent handhold securely fastened beside each crawling board.

Each employee on a self-contained adjustable scaffold shall be protected by:

- Guardrail systems (with minimum 200 pound top rail capacity) when the platform is supported by the frame structure;
- Both a personal fall arrest system and a guardrail system (with minimum 200 pound top rail capacity) when the platform is supported by ropes.

Each employee on a walkway located within a scaffold shall be protected by:

- Guardrail systems (with minimum 200 pound top rail capacity) installed within 9 1/2 inches (24.1 cm) of and along at least one side of the walkway.

Excavations

Fall protection will be provided to employees working at the edge of an excavation that is 6-feet or deeper. Employees in these areas are required to use the fall protection systems as designated in this program.

- Excavations that are 6-feet or deeper shall be protected by guardrail systems, fences, barricades, or covers.
- Walkways that allow employees to cross over an excavation that is 6-feet or deeper shall be equipped with guardrails.

Work on low-slope roofs

When work is performed less than 6 feet from the roof edge, each employee is protected from falling by:

- Guardrail systems;
- Safety net systems;
- Travel restraint systems; or
- Personal fall arrest systems.

When work is performed at least 6 feet but less than 15 feet from the roof edge, each employee is protected from falling by:

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- Guardrail systems;
- Safety net systems;
- Travel restraint systems; or
- Personal fall arrest systems.

*Note: Designated areas may be used when performing work that is both infrequent and temporary.*

When work is performed 15 feet or more from the roof edge, each employee shall be protected from falling by:

- Guardrail systems;
- Safety net systems;
- Travel restraint systems;
- Personal fall arrest systems; or
- Designated areas.

Fall protection is not required provided:

- Work is both infrequent and temporary; and
- Employees are prohibited from going within 15 feet of the roof edge.

Walking working surfaces not otherwise addressed

Except as provided elsewhere in this section, each employee on a walking-working surface 4 feet or more above a lower level is protected from falling by:

- Guardrail systems;
- Safety net systems; or
- Personal fall protection systems, such as:
  - Personal fall arrest;
  - Travel restraint; or
  - Positioning systems.

**6.0 Protection From Falling Objects**

When an employee is exposed to falling objects, they shall wear appropriate head protection.

One or more of the following shall protect employees from falling objects:

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- Erecting toe boards, screens, or guardrail systems to prevent objects from falling to a lower level;
- Erecting canopy structures and keeping potential falling objects far enough from an edge, hole, or opening to prevent them from falling to a lower level; or
- Barricading the area into which objects could fall, prohibiting employees from entering the barricaded area, and keeping objects far enough from an edge or opening to prevent them from falling to a lower level.

**7.0 Fall Protection Systems**

All fall protection systems shall meet the all applicable standards including, but not limited to, OSHA 29 CFR 1910.29 (Subpart D – Walking and Working Surfaces), OSHA 29 CFR 1910.40 (Subpart I – Personal Protective Equipment), OSHA 29 CFR 1926 Subpart M – Fall Protection, ANSI A10.32 Fall Protection Systems for Construction and Demolition Operations, and ANSI Z359 Fall Protection Code.

7.1 Conventional Fall Protection Systems

Conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) provide the greatest protection against fall hazards and should be considered a priority when addressing employee protection.

7.1.1 Guardrail Systems

- Installed and temporary guardrail systems shall comply with OSHA 29 CFR 1190.23-Guarding Floor and Wall Openings and Holes. Guardrail systems installed during construction projects and activities shall comply with OSHA 29 CFR 1926.502-Fall Protection Systems Criteria and Practices. Guardrail systems provide a barrier to prevent employees from falling to lower levels, and which designates an area in which work may take place without the use of additional fall protection PPE.
- Where guardrail systems are in place as a fall protection measure, the railing shall have a vertical height of 42 inches (+/- 3 inches) measured from the upper surface of the top rail to the working surface and consist of a top rail, intermediate rail, and posts.
- The intermediate rail shall be approximately halfway between the top rail and the working surface.
- Guardrail systems must be capable of withstanding, without failure, a force of at least 200 pounds in any direction.

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- When 200 pounds of force is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches above the working surface.
- Stair railings shall be not more than 34 inches or less than 30 inches from the upper surface of the top rail to the forward edge of the tread surface.
- A standard toe-board shall be provided on all guardrail systems where persons can pass under the work surface; there is moving machinery; and/or equipment utilized on the elevated surface with which falling equipment creates a hazard. Toe-boards shall be 4 inches nominal in vertical height and securely fastened in place with not more than ¼ inch clearance above the working surface. Where material is stored near the guardrail system, at heights exceeding the toe-board, paneling from the work surface to the intermediate rail shall be provided.
- Engineered guardrail systems may be utilized provided they meet these requirements and are installed as per the manufacturer’s specifications.
- Portable guardrail systems may be utilized as a fall protection measures provided they meet the OSHA and ANSI guardrail specification requirements.

7.1.2 Safety Net Systems

- Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet below such level.
- Safety nets shall extend outward from the outermost projection of the work surface as follows:

<b>Vertical distance from working level to net</b>	<b>Minimum distance of outer edge of net to the edge of the working surface</b>
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet

- Safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to the drop test.



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- The drop-test shall consist of a 400 pound bag of sand, 28-32 inches in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards.
- If it is unreasonable to perform the drop-test, the university shall certify that the net installation is in compliance with the provisions of this section by preparing a certification record prior to the net being used. The certification record must include an identification of the net installation for which the certification record is being prepared; the date that it was determined that the net installation was in compliance with this section and the signature of the person making the determination and certification. The most recent certification record for each net installation shall be available at the jobsite for inspection.
- Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.
- Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.
- The maximum size of the mesh openings shall not exceed 36 square inches nor be longer than 6 inches on any side, and the openings, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches. All mesh crossings shall be secured to prevent enlargement of the mesh opening.
- Each safety net shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds.
- Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches apart.

7.1.3 Fall Restraint Systems

These systems are typically installed on aerial lifts and boom lifts. Refer to the program covering these types of equipment, OCS-102, for additional information on fall restraint systems and aerial lifts. Fall restraint systems may also be utilized on elevated work surfaces as a preventative measure against fall hazards or as a positioning device system. These systems prevent an employee from approaching a fall hazard through the use of a lanyard and body harness.

- The restraint lanyard must be short enough to prevent a fall from occurring; be protected against cutting and abrasion; and attach the body harness directly to the anchor point independently of any other lines.

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- When used as a positioning device system, the lanyard length shall be rigged such that an employee cannot free fall more than 2 feet.
- Full body harness use is required when utilizing fall restraint systems.
- Anchor points must be capable of supporting at least twice the potential impact load of an employee’s fall or 3,000 pounds, whichever is greater.
- All components of the fall restraint system including connectors, D-rings, snap-hooks, lanyards and body harnesses/belts shall meet all applicable OSHA requirements.
- Fall protection equipment shall not be used to hoist equipment or tools to an elevated work surface. This includes window washing equipment.
- Fall protection equipment including restraint lanyards and body harnesses should be stored in a well-ventilated, clean, dry area free from temperature and humidity extremes, corrosive materials or other contaminants.

7.1.4 Personal Fall Arrest Systems

These systems are employed to prevent injury to employees if a fall from an elevated work surface occurs. The use of a fall arrest system requires a body harness system to be worn by the employee. Body belts are not permitted to be used with fall arrest systems. Fall arrest systems shall be engineered and constructed to prevent employees from reaching the work surface below if a fall occurs.

- All components of a fall arrest system including connectors, D-rings, Snap-hooks, lanyards, body harnesses, life lines, ropes and straps shall be designed and engineered for use with a fall arrest system and meet all applicable ANSI and OSHA requirements.
- Employees utilizing personal fall arrest systems shall not perform work alone.
- Lifeline systems used as a component of a fall arrest system shall be designed, installed and used under the supervision of a qualified person as part of a fall protection program.
- Lifelines shall be protected from cutting and abrasion.
- Lifelines or other components of a fall arrest system should not be attached to guardrail systems, ladders, scaffolding components, building fixtures, conduit or plumbing, other lanyards, roof stacks/vents/pipes or other unauthorized anchor points.
- Anchor points used for attachment of fall arrest equipment shall be independent of any other anchor point and capable of supporting at least 5,000 pounds per employee attached.
- When stopping a fall, personal fall arrest systems shall:

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- Limit maximum arresting force on an employee to 1,800 pounds.
- Ensure employees can neither free fall more than 6 feet or contact any lower level as a result of a fall.
- Bring an employee to a complete stop and limit maximum deceleration distance to 3.5 feet.
- Be capable of withstanding twice the potential impact energy of an employee falling a distance of 6-feet or the fall distance permitted by the system, whichever is less.
- The attachment point of the body harness shall be located in the center of the wearer’s back near shoulder level.
- Fall arrest systems are to only be used as personal protective equipment and not to hoist equipment or tools to elevated work surfaces.
- Fall protection equipment including restraint lanyards and body harnesses should be stored in a clean, dry area free from temperature and humidity extremes, corrosive materials or other contaminants.

7.2 Specialized Fall Protection Systems

If conventional fall protection systems are not practical or feasible, the use of a specialized fall protection system including a warning line system or safety monitoring system must be utilized to protect employees from fall hazards.

7.2.1 Warning Line Systems

- Warning line systems are typically composed of a physical barrier located near an unprotected side or edge to warn employees they are approaching a fall hazard area. Warning line system use is restricted to low slope roof top work and shall be used in conjunction with a safety monitoring system at a minimum. These systems may also utilize a guardrail or personal fall arrest system to minimize/eliminate the fall hazard.
- These systems shall be erected around all open sides of the roof work area not less than 6 feet from the roof edge.
- If mechanical equipment is being utilized on the roof top, the warning line shall be not less than 6 feet from the roof edge parallel to the direction of equipment operation, and not less than 10 feet from the roof edge perpendicular to the direction of the equipment operation.
- Points of access, material handling areas, storage areas and hoisting areas shall be clearly delineated and connected to the work area by an access path formed by two warning lines.

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- When the path or point of access is not in use; a rope, wire, chain or other barricade equivalent in strength and height to the warning line shall be placed across the path.
- Warning lines shall consist of ropes, wires or chains and supported by stanchions.
- The line shall be flagged every 6 feet with high visibility flags.
- The line shall be supported to ensure the lowest point is not less than 34 inches above the work surface; and not more than 39 inches at its highest point.
- The warning line system, once erected, must be capable of withstanding a force of at least 16 pounds applied horizontally against the stanchion; and the rope, chain or wire shall have a minimum tensile strength of 500 pounds.
- The line shall be attached at each stanchion in such a way that pulling on one section of the line will not result in slack being taken up in adjacent sections.
- Employees are not permitted to enter the area between the roof edge and warning line unless work is being conducted on that portion of the roof and adequate fall protection measures are in place.

7.2.2 Safety Monitoring Systems

- A safety monitoring system relies on a competent person to monitor the work area and ensure employees are aware of fall hazards as they are working. This system may only be utilized on a low-slope roof and should be considered a last resort for protecting employees from fall hazards.
- A competent person must be designated prior to work taking place on a roof top. The competent person, or their designee who has received adequate training and possesses sufficient knowledge, will act as a safety monitor during work and shall:
  - Be competent to recognize fall hazards;
  - Warn the employee when it appears they are unaware of a fall hazard or are acting in an unsafe manner
  - Be on the same working surface and within visual distance of the employees performing work;
  - Be close enough to communicate verbally with the employees;
  - Ensure no unauthorized personnel access the work area;
  - Have no other responsibilities which may distract them while performing safety monitoring duties.
  - Have the responsibility to order work stoppage and personnel removal from elevated work areas in the event of dangerous, hazardous, or life threatening circumstances.
  - Mechanical equipment shall not be utilized where a safety monitoring system is being used as the fall protection method. Additional fall protection

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measures are required in these situations such as guardrail systems, fall restraint systems, fall arrest systems or warning line systems.

- No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system; and
- Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors.

### **8.0 Portable Ladders**

Portable ladders are a fundamental tool used on campus. Although fall protection is not required for their use, there are specific requirements set forth in 29 CFR 1910.23. Therefore, the following procedures apply to all portable ladders on campus:

- The appropriate type of ladder is being used for the job/project.
- Ladders are inspected before initial use in each work shift, and more frequently as necessary, to identify any visible defects that could cause employee injury;
- Rungs and steps of portable metal ladders are corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping;
- Each stepladder or combination ladder used in a stepladder mode is equipped with a metal spreader or locking device that securely holds the front and back sections in an open position while the ladder is in use;
- Ladders are not loaded beyond the maximum intended load;
- Ladders are used only on stable and level surfaces unless they are secured or stabilized to prevent accidental displacement;
- No portable single rail ladders are used;
- No ladder is moved, shifted, or extended while an employee is on it;
- Ladders placed in locations such as passageways, doorways, or driveways where they can be displaced by other activities or traffic:
  - Are secured to prevent accidental displacement; or
  - Are guarded by a temporary barricade, such as a row of traffic cones or caution tape, to keep the activities or traffic away from the ladder;
- The cap (if equipped) and top step of a stepladder are not used as steps;
- Portable ladders used on slippery surfaces are secured and stabilized;
- The top of a non-self-supporting ladder is placed so that both side rails are supported, unless the ladder is equipped with a single support attachment;

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- Portable ladders used to gain access to an upper landing surface have side rails that extend at least 3 feet above the upper landing surface;
- Extension ladders are placed using the 4-to-1 principal such that the ladder is placed at a distance from the wall that is equal to ¼ of the height that the ladder is extended (i.e. a ladder that is extended 20 feet high should have its base approximately 5 feet from the wall).
- Ladders and ladder sections are not tied or fastened together to provide added length unless they are specifically designed for such use;
- Ladders are not placed on boxes, barrels, or other unstable bases to obtain additional height.
- When employees are on extension ladders at heights of 20 feet or greater, either a second person is present to steady the ladder’s base or the top of the ladder is effectively tied off to a sound anchor point.

**9.0 Fall Hazard Assessments**

In accordance with this program, all buildings, rooftops, and walking-working surfaces with a fall hazard of at least 4 feet (6 feet for Construction) on campus shall be assessed by EHS and Facilities to identify:

- Potential fall hazards;
- Required fall protection;
- Feasibility of fall protection; and
- Authorized employees who are permitted to access that location.

The assessments will be maintained and stored by EHS and will be updated accordingly when buildings are renovated or when the type of work changes.

**10.0 Fall Protection Plans**

In the event that fall protection is not feasible or creates a greater hazard, a fall protection plan will be designed for that specific location. The determination of this shall be in accordance with the Fall Hazard Assessment conducted by EHS. Furthermore, plans will be written by EHS for each instance.

The following requirements apply to any fall protection plan used at Radford University:

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- The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the work is being performed and the plan must be maintained up to date;
- Any changes to the fall protection plan shall be approved by a qualified person;
- A copy of the fall protection plan with all approved changes shall be maintained at the job site;
- The implementation of the fall protection plan shall be under the supervision of a competent person;
- The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard;
- The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems;
- The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones;
- Where no other alternative measure has been implemented, a safety monitoring system shall be implemented; and
- The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.

In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) EHS shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

**11.0 Rescue Operations**

(Prompt rescue shall be provided for personnel who have fallen by contacting 911 or RUPD (540-831-5500) from a phone or radioing for help. No work shall be performed where an emergency cannot be immediately observed and prompt rescue assistance summoned).

When a personal fall arrest system is utilized as a fall protection measure, the competent person must develop written rescue operations to ensure employees can be safely rescued from the fall. Rescue operations can be accomplished in a variety of ways. Specific operations should be developed based on the job being performed to ensure the safest method of rescue is employed.



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Employees utilizing personal fall protection systems as a fall protection method shall be provided with at least one other designated employee to monitor ongoing operations and have sufficient means to communicate in the event of a fall.

**12.0 Accident Investigations**

All incidents that result in injury to workers, as well as near misses, regardless of their nature, shall be reported and investigated. Investigations shall be conducted by Environmental Health and Safety (EHS), a competent fall protection supervisor, and the safety committee (if applicable).

The investigation will occur as soon after an incident as possible to identify the cause and means of prevention to eliminate the risk of reoccurrence.

In the event of such an incident, the Fall Protection Program shall be reevaluated by EHS to determine if additional practices, procedures, or training are necessary to prevent similar future incidents.

**13.0 Training Requirements**

Employees who are exposed to fall hazards, use personal fall protection, or work with portable ladders are required to be trained by a qualified person in the following topics:

- The nature of the fall hazards in the work area and how to recognize them;
- The procedures to be followed to minimize those hazards;
- The correct procedures for installing, inspecting, operating, maintaining, and disassembling the personal fall protection systems that the employee uses; and
- The correct use of personal fall protection systems and equipment including, but not limited to, proper hook-up, anchoring, and tie-off techniques, and methods of equipment inspection and storage, as specified by the manufacturer;
- The proper set-up and use of designated areas; and
- The requirements for inspecting portable ladders.

Training shall occur every 3 years or when inadequacies in an affected 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 use equipment or perform the job safely.

**14.0 References:** 29 CFR 1910.21, 29 CFR 1910.23, 29 CFR 1910.28, 29 CFR 1910.29, 29 CFR 1910.30, 29 CFR 1926.451, 29 CFR 1926.500, 29 CFR 1926.502

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**15.0 Document Revision History**

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