



Fall Protection Program

Latest Revision Date: March 2017

1.0 PURPOSE

This program establishes a means to analyze elevated work tasks and determine appropriate personal protection against falls in accordance with Occupational Safety and Health Administration (OSHA) Construction and General Industry regulations:

- “Fall Protection,” 29 CFR 1926 Subpart M
- “Walking and Working Surfaces,” 29 CFR 1910 Subpart D
- “Powered Platforms, Man lifts, and Vehicle-Mounted Platforms,” 29 CFR 1910 Subpart F
- “Scaffolds,” 29 CFR 1926 Subpart L

2.0 SCOPE and APPLICATION

The Bucknell University Fall Protection Program applies to all employees who are exposed to unprotected sides or edges of surfaces that present a falling hazard of six feet or more for construction work and 4 feet or more for industrial maintenance work to a lower level.

Employees will not be required, nor allowed to perform any duties which require the employee to get closer than six feet to an unprotected edge, platform, and walkway of any building or utilize elevated equipment unless the employee is properly secured from falling. Additionally, the Fall Protection Program applies to all employees in order to minimize slips, trips and falls on the same elevation. All employees can control fall hazards in their work area by maintaining good housekeeping and by reporting conditions that may lead to slips, trips and falls to the appropriate facilities maintenance unit.

Contractors for the University are required to comply with all applicable OSHA regulations and shall have their own fall protection program.

3.0 RESPONSIBILITIES

3.1 Environmental Health & Safety (EHS) Department shall:

- 3.1.1 Provide technical information and assist departments in implementing the fall protection program;
- 3.1.2 Provide technical information and assist Facilities Management Capital and Campus Projects in designing controls for fall protection into projects;
- 3.1.3 Provide and/or coordinate fall protection instruction as needed;
- 3.1.4 Investigate and document all reported accidents that are related to fall hazards, recommending corrective actions; and
- 3.1.5 Review and revise the Fall Protection Program, as needed for compliance with applicable regulations.
- 3.1.6 Act as the “Qualified Person” which entails:

1. Maintain professional certification or other requirements in their subject field;
2. Provide design, analysis, evaluation and specification in their subject field;
3. Maintain records of their designs, analyses, evaluations, and specifications according to the requirements of the Fall Protection Program.

3.2 Facilities Department shall:

- 3.2.1 Maintain and update Design Guidelines requiring that projects be designed according to current OSHA standards and that engineering controls for fall protection such as guardrails and anchorage points for occupant use and maintenance work be designed into projects wherever feasible; and
- 3.2.2 Accept reports of hazards and either process work orders to correct the hazard or direct the request to another appropriate unit.

3.3 Supervisors shall:

- 3.3.1 Ensure that employees are informed, trained, and provided with the appropriate fall protection systems and equipment to be protected from potential fall hazards associated with job tasks; and
- 3.3.2 Coordinate the correction of fall hazards brought to their attention by employees;
- 3.3.3 Act as the “competent person” for job sites under their control that contain fall hazards;
 1. Implement all aspects of the program for work areas under their control;
 2. Receive training for “competent person” as defined by OSHA for fall protection;
 3. Act as the “competent person” for job sites under their control that contain fall hazards;
 4. Evaluate fall hazards in work areas under their control;
- 3.3.4 Complete a “First Report of Injury” report and produce any additional documentation needed to investigate and work related injuries and illnesses.

3.4 Employees shall:

- 3.4.1 Use a means of fall protection (guardrails, personal fall arrest/restraint systems) for all work from elevated heights greater than six feet for construction work and 4 feet for industrial maintenance work;
- 3.4.2 Alert their supervisors when requested to work from heights without a means of fall protection;
- 3.4.3 Alert their supervisor about the level of fall protection training they have or have not received when requested to work from elevated heights;
- 3.4.4 Report incidents relating to fall hazards to their supervisor.

4.0 PROGRAM ELEMENTS

4.1 Fall Hazards- Falls may be classified into three general categories: 1. Slips, trips and falls on the same level; 2. Falls on stairs; and 3. Falls from elevations. Slips and trips are generally caused by a lack of good housekeeping and inadequate maintenance of walking and working surfaces. Employees should keep their area clean and orderly. If they are not equipped to eliminate a hazard, they should contact the appropriate maintenance personnel to correct the problem. These hazards may include icy sidewalks, wet floors, torn floor coverings and stair treads, and missing or broken hand rails and guard rails.

Fall hazards from elevations include, but are not limited to, unprotected sides and edges of roofs, excavations, skylights, floor holes, wall openings, and all other walking or working surfaces where personnel can possibly fall four feet or more to a lower level. Personnel should alert their supervisors to potential fall hazards not already identified and controlled.

4.1.1 The following are fall hazards which require protection.

- Unprotected edges, open sided floors, platforms, and runways four feet or more in height.
- Open sided floors, ramps, walkways etc. that are adjacent to or above dangerous operations must be guarded regardless of height.
- Wall openings from where there is a drop of more than 4 feet.
- Open windows from which there is a drop of more than 4 feet and the bottom of the window is less than 3 feet above the floor or platform.
- Hatchways and chutes floor openings.
- Any opening more than 4 feet in elevation where a significant portion of the body is leaning over or through to perform work.
- Skylights that are even with the roof surface, or that may otherwise serve as a walking/working surface.

- Scaffolds over 10 feet.
- Aerial lift devices- boom style
- Exceptions to this requirement include
 - The working sides of loading docks
 - Exposed perimeters of entertainment stages.
 - Portable ladders
 - Scaffolds up to 10 feet in height
 - The edge of an excavation up to 6 feet in depth
 - Scissor lifts with appropriate guardrails

5.0 ENGINEERING CONTROLS

5.1 Guardrails, Parapets and Toe boards

- Top edge height of top rails, or equivalent guardrail system members, must be between 39 and 45 inches above the walking/working level, except when conditions warrant otherwise and all other criteria are met (e.g., when employees are using stilts, the top edge height of the top rail must be increased by an amount equal the height of the stilts).
- Standard toe boards must be a minimum of 4 inches high (3 ½ inches for construction), no more than 1/4 inch clearance to the floor. If a mesh material is used, the opening must be less than 1 inch
- Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structures, must be installed between the top edge and the walking/working surface when there is no wall or other structure at least 21 inches high.
 - Midrails must be midway between the top edge of the guardrail system and the walking/working level.
 - Screens and mesh must extend from the top rail to the walking/working level, and along the entire opening between rail supports.
 - Intermediate members (such as balusters) between posts must be no more than 19 inches apart.
 - Other structural members (such as additional midrails or architectural panels) must be installed so as to leave no openings wider than 19 inches.
- Guardrail systems must be capable of withstanding at least 200 pounds of force applied within 2 inches of the top edge, in any direction and at any point along the edge, and without causing the top edge of the guardrail to deflect downward to a height less than 39 inches above the walking/working level.
- Midrails, screens, mesh, and other intermediate members must be capable of withstanding at least 150 pounds of force applied in any direction at any point along the midrail or other member.
- Guardrail systems must not have rough or jagged surfaces that would cause punctures, lacerations, or snagged clothing.

- Top rails and midrails must not cause a projection hazard by overhanging the terminal posts.
 - Parapets which are a permanent building structure will only be accepted as a permanent engineering control if they are 39-45 inches in height. Lower parapets are not an adequate fall protection control.

5.2 Skylights

- Skylights that may be used as a walking or working surface must be protected by a standard railing, standard skylight screen, grill work with 4 by 4 inch openings or slat work with 2-inch openings; and
- Standard skylight screens must be capable of withstanding minimum load of 200 pounds applied perpendicular to any point on the screen and will not deflect under ordinary loads and impacts and break glass.

5.3 Covers

- Covers for holes, including grates, shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time;
- Covers located on roadways and vehicular aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over it;
- All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees;
- Covers shall be marked with the word “HOLE” or “COVER” to provide warning of the hazard when it is not readily apparent; and
- While a cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.

6.0 Fall Protection systems

6.1 Personal Fall Arrest System

A personal fall arrest system consists of a full-body harness, lanyard, and anchor point OR a full-body harness, lanyard, lifeline, anchor point, and deceleration/grabbing device. All fall protection equipment shall meet or exceed appropriate American National Standards Institute (ANSI) standards. Bucknell employees shall use only commercially manufactured equipment specifically designed for fall protection and certified by a nationally recognized testing laboratory. All fall protection equipment must bear the marking of the manufacturer and approvals for specified use. Requirements for a personal fall arrest system include but are not limited to the following:

- **Body Harness** - Only full-body harnesses shall be used. The use of a body belt as fall protection is prohibited.
- **Connecting Device** - Shock-absorbing lanyards and lifelines
 - o Lanyards and lifelines shall have a minimum breaking strength of 5000 pounds;
 - o Lanyards shall not exceed six feet in length. Self-retracting lanyards are the only lanyard to be used in aerial lifts.
 - o Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses shall be made from synthetic fibers;
 - o Connecting assemblies shall have a minimum tensile strength of 5,000 pounds;
 - o Self-retracting lifelines and lanyards shall have a tensile strength of at least 3000 pounds and limit free fall to two feet or less (5,000 pounds for ripstitch lanyards, and tearing and deforming lanyards);
 - o Personal fall arrest systems shall limit the maximum arresting forces to 1800 pounds with a full body harness;
 - o The maximum free fall distance is six feet for all systems;
 - o The maximum deceleration distance is 3.5 feet;
 - o Personal fall arrest systems shall have sufficient strength to withstand twice the potential impact energy of the falling employee;
 - o Lifelines shall be protected against cutting and abrasions;
 - o 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 two. On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.
 - o Each employee shall be attached to a separate lifeline when vertical lifelines are used. On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.
 - o **Anchorage** - Anchorage point and anchorage connector
 - Anchorages used for personal fall arrest systems shall be independent of any anchorage being used to support or suspend platforms and be capable of supporting at least 5000 pounds per employee attached, or shall be designed, installed (temporarily or permanently), and used as part of a complete fall arrest system which maintains a safety factor of two and under the supervision of a qualified person;

- A qualified person shall determine all anchor points, both temporary and permanent. Permanent anchor points shall be properly marked;
- Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other regulations.

6.2 Travel Restraint System

Travel restraint systems are achieved through the use of a fall arrest system that does not allow the worker to reach an unprotected edge or other fall hazard. This is normally accomplished by limiting the length of the lanyard used. The following components must make up the system:

- A full body harness or Body belt when NO chance of a fall exists.
- Connecting device-usually a rope lanyard of custom length to prevent worker from reaching a fall hazard. A shock absorbing lanyard is never to be used.
- Anchor point- Must be 1000 lbf (pound-force) or twice the expected force.

6.3 Safety Net System

- Safety nets must be installed as close as practicable under the surface on which employees are working, but in no case more than 30 feet below.
- When nets are used on bridges, the potential fall area must be unobstructed.
- Safety nets must extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet
5 to 10 feet	10 feet
More than 10 feet	13 feet

- Safety nets must be installed with sufficient clearance to prevent contact with the surface or structures under them when subjected to an impact force equal to the drop test described below.
- Safety nets and their installations must be capable of absorbing an impact force equal to the drop test described below.

- Safety nets and safety net installations must be drop-tested at the jobsite:
 - After initial installation and before being used.
 - Whenever relocated.
 - After major repair.
 - At 6-month intervals if left in one place.
- The drop test consists of a 400 pound bag of sand 28-32 inches in diameter dropped into the net from the highest surface at which employees are exposed to fall hazards, but not from less than 42 inches above that level.
- When the employer can demonstrate that it is unreasonable to perform the drop-test described above, the employer or a designated competent person shall certify that the net and net installation have sufficient clearance and impact absorption by preparing a certification record prior to the net being used as a fall protection system. The certification must include:
 - Identification of the net and net installation.
 - Date that it was determined that the net and net installation were in compliance.
 - Signature of the person making the determination and certification.
- The most recent certification record for each net and net installation must be available at the jobsite for inspection.
- Safety nets must be inspected for wear, damage, and other deterioration at least once a week, and after any occurrence which could affect the integrity of the system.
- Defective nets shall not be used, and defective components must be removed from service.
- Objects which have fallen into the safety net, such as scrap pieces, equipment, and tools, must be removed as soon as possible from the net and at least before the next work shift.
- Maximum mesh size must not exceed 6 inches by 6 inches. All mesh crossings must be secured to prevent enlargement of the mesh opening, which must be no longer than 6 inches, measured center-to-center.
- Each safety net, or section thereof, must have a border rope for webbing with a minimum breaking strength of 5,000 pounds.
- Connections between safety net panels must be as strong as integral net components, and must not be spaced more than 6 inches apart.

6.4 Designated Areas

A distinct portion of a walking-working surface delineated by a warning line in which employees may perform work without additional fall protection. The designated area must meet the following requirements:

- Employees remain within the designated area while work operations are underway;
- The perimeter of the designated area is delineated with a warning line consisting of a rope, wire, tape, or chain
- The employer must ensure each warning line:
 - Has a minimum breaking strength of 200 pounds (0.89 kN);

- Is installed so its lowest point, including sag, is not less than 34 inches (86 cm) and not more than 39 inches (99 cm) above the walking-working surface;
- Is supported in such a manner that pulling on one section of the line will not result in slack being taken up in adjacent sections causing the line to fall below the 34 inches.
- Is clearly visible from a distance of 25 feet (7.6 m) away, and anywhere within the designated area;
- Is erected as close to the work area as the task permits;
- Is erected not less than 6 feet (1.8 m) from the roof edge for work that is both temporary and infrequent, or not less than 15 feet (4.6 m) for other work.

7.0 Specific Fall Protection Applications

7.1 Low Sloped Roofs (less than or equal to a 4/12 pitch)

When work is performed **less than 6 feet** from the roof edge- employee(s) must be protected from falling by using one of the following options:

- A guardrail system
- A safety net system
- A travel restraint system
- A personal fall arrest system

When work is performed at **least 6 feet but less than 15 feet** from the roof edge- employee(s) must be protected from falling by using one of the following options:

- A guardrail system
- A safety net system
- A travel restraint system
- A personal fall arrest system
- A designated area -as long as the work being performed is **BOTH** infrequent and temporary.

When work is performed **15 feet** or more from the roof edge- employee(s) must be protected from falling by using one of the following options:

- A guardrail system
- A safety net system
- A travel restraint system
- A personal fall arrest system
- A designated area
- IF the work is **BOTH** infrequent and temporary no requirement for fall protection is needed if a rule is implemented and enforced that prohibits employees from going within 15 feet from the roof edge.

7.2 Aerial Lifts

Aerial lifts include the following types of vehicle mounted aerial devices used to elevate personnel to job sites above ground:

- Articulating boom platforms are designed to reach up and over obstacles.
- Extensible or telescoping boom platforms may extend over one hundred feet.
- Vehicle mounted bucket lifts are used to repair utility lines.
- Scissor lifts extend into the air via a series of crisscross supports.
- Personal man lifts are lightweight and designed for one person to use indoor.

I. Specific requirements

A. Aerial lifts shall be secured in the lower traveling position before the truck is moved for highway travel;

B. Lift controls shall be tested each day prior to use;

C. Only personnel authorized by a fall protection competent person and trained in the operations of the lift shall operate an aerial lift:

D. 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;

E. A full-body harness shall be worn and a lanyard attached to the engineered anchor point in the basket when working from an aerial lift (exception: a harness is not required in a scissor lift or personal man lift with surrounding guardrail system and closing gate or latch chain);

F. Belting off to an adjacent pole structure, or equipment while working from an aerial lift shall not be permitted;

G. Boom and basket load limits specified by the manufacturer shall not be exceeded;

H. The brakes shall be set and when outriggers are used, they shall be positioned on pads or other solid surface. Wheel chocks shall be installed when using an aerial lift on an incline;

I. An aerial lift truck shall not be moved when the boom is elevated in a working position, except for equipment which is specifically designed for this type of operation;

J. Articulating and extensible boom platforms shall have both platform and ground controls; and

K. Before moving an aerial lift for travel, the boom shall be inspected to ensure that it is properly cradled and outriggers are in the stowed position.

When moving a boom lift, a fall limiter lanyard must be worn. Never use a standard 6 foot lanyard.

7.3 Scaffolds

A. Selection

The proper scaffold selected for the task by the competent person is based upon the type of work to be conducted and the working load to be supported.

1. Light duty scaffolds are intended for workers and tools only. The design load should be that it will support a working load of 25 pounds per square foot;
2. Medium duty scaffolds are intended for workers, tools and construction materials. The design load should be that it will support a working load of 50 pounds per square foot; and
3. Heavy duty scaffolds are intended for workers, tools, stored materials, and construction materials. The design load of the scaffold should be that it will support a working load of 75 pounds per square foot.

All scaffolds must be capable of supporting at least four times the design load.

B. General Requirements

1. Fall protection is required for all scaffold use 10 feet above a lower level.
2. All scaffolds, where work is conducted in excess of 6 feet in height, shall have 4 inch toe boards;
3. A scaffold shall not be moved while personnel are on it;
4. Follow all manufacturer's guidelines and special warnings if the scaffold is commercially produced;
5. The maximum work level height shall not exceed 4 times the least base dimension of the scaffold. Example: a four foot by six foot scaffold cannot exceed sixteen feet in height at the work platform level;
6. The minimum working platform width is two feet;
7. The supporting structure for the scaffold must be rigidly braced, using adequate cross bracing or diagonal bracing with rigid platforms at each work level;
8. Working platforms should have a nonslip surface;
9. Scaffolds should be used only on an even surface;
10. The platform surface should be kept clear of extraneous tools and materials;
11. The work level platform shall be wood, aluminum, plywood planking, steel or expanded metal for the full width of the scaffold, except for necessary protected openings
12. Work platforms shall be secured in position;
13. All work platform planking shall be in compliance with OSHA 1926.453(a)(3)(v). Wood shall be compliance grade lumber. Planks shall be overlapped a minimum of 12 inches and extended over supports 6 – 12 inches;
14. Follow all manufacturer guidelines in the assembly of the scaffold. Do not use or assemble the scaffold, if unsure of the correct assembly procedure;
15. Hard hats must be worn within an area beneath elevated work where objects could fall from a height and strike a worker; and
16. Mobile scaffolds shall not be moved unless the surface of travel is within 3 degrees of level and free of pits, holes and obstructions, and the employee on the scaffold has advanced knowledge of the movement.

II. Inspection of Scaffolds

Prior to the use of any scaffold, an inspection must be conducted by a competent person, and then daily during usage of the scaffold.

- A. Carefully examine the scaffold for broken or missing cross bracing, broken supporting structure, working platform, and other damaged parts. In addition, all walking and working surfaces must be free of grease, oil, paint, or other slippery substances;
- B. The scaffold should be equipped with positive wheel lock casters that are secured in place;
- C. The joint between working platform and supporting structure must be tight, and all hardware and fittings should be attached firmly. Movable parts should operate freely without binding or undue play;
- D. All wood parts must be free of sharp edges and splinters. Visually inspect the scaffold to be free of shakes, warpage, decay or other irregularities. Metal parts must be free of sharp edges, burrs and corrosion. Inspect for dents or bends in supporting structure, cross braces and walking/working surfaces;
- E. Check all working platform to support structure connections, hardware connections and rivets. If a scaffold tips over, inspect the scaffold for damage before continuing work; and
- F. Damaged scaffolds must be withdrawn from service and either repaired or destroyed. When a defect or unsafe condition is found, personnel shall tag or mark the scaffold so that it will not be used until corrective action is taken. Defective or unsafe situations shall be reported to the supervisor. Field repairs and the fabrication of improvised scaffolds is prohibited.

7.4 Other areas not defined

It is important to understand the need for fall protection, If you find yourself in a position that places you at any risk of a fall greater than 4 feet, whether it is a steep roof, a floor opening or a trench. Please contact your supervisor or EH&S for assistance in determining the proper fall protection system needed.

8.0 Rescue

Prompt rescue shall be provided for personnel who have fallen by contacting 9-1-1 or radioing for help. No work shall be performed where an emergency cannot be immediately observed and prompt rescue assistance summoned. Any other personal protective equipment deemed necessary for the task under the Personal Protective Equipment Standard must be worn. This includes but is not limited to hard hats, gloves, safety glasses, and steel toed boots. Hard hats shall be worn within an area beneath elevated work where objects could fall from a height and strike a worker.

9.0 Equipment Inspections and Maintenance

9.1 Impact Loading

Any fall arrest system or component that has been used to arrest a fall (impact loading) shall be immediately removed from service until is inspected and determined by a competent person to be undamaged.

9.2 Inspection

Visual fall protection equipment inspections shall be conducted by personnel prior to each use. If, upon inspection, a piece of equipment shows any signs of wear it must immediately be removed from service and the supervisor notified.

9.3 Maintenance

When needed, fall protection devices should be washed in warm water using a mild detergent, rinsed thoroughly in clean warm water and allowed to dry at room temperature. Stow equipment in clean area away from strong sunlight and extreme temperatures which could degrade materials. Check the manufacturer's recommendations for cleaning, maintenance and storage information.

10.0 PROGRAM EVALUATION

10.1 The Fall Program will be reviewed annually and revised as needed.

11.0 DOCUMENTATION and RECORDKEEPING

11.1 All training records and fall related documents will be filed accordingly in the EH&S department.

12.0 REVISION HISTORY

Originated: 3/2017