



Department of

*Environmental
Safety,
Sustainability & Risk*

DIVISION OF ADMINISTRATIVE AFFAIRS

**FALL
PROTECTION
PROGRAM**

Revised – December r 2014

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Program Overview

I. Purpose.

This University 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
- “Telecommunications,” 29 CFR 1910.268 Subpart R

II. Scope.

The University of Maryland 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.

Exceptions to this requirement include the working sides of loading docks and exposed perimeters of entertainment stages. Employees may use portable ladders without fall protection equipment up to sixty feet. Employees may work on scaffolds and aerial lifts up to 10 feet in height and on the edge of an excavation up to 6 feet in depth without fall protection.

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 of Maryland are required to comply with all applicable OSHA regulations and shall have their own fall protection program.

III. Principles.

The University is dedicated to providing safe work facilities for students, employees, and visitors, and complying with federal and state occupational health and safety standards. Administrators, faculty, staff and students all share a responsibility to reduce the hazards leading to falls.

Fall hazards must first be controlled through engineering controls, if feasible. When engineering controls are not feasible, then personal fall arrest systems, administrative controls and training must be instituted. Employees, students, visitors and contractors when using personal fall arrest systems shall be connected to an anchor point 100% of the time (one hundred percent tie-off) with either dual lanyards, self-retracting lifelines or a combination of the two.

IV. Responsibilities.

- A. Department of Environmental Safety, Sustainability and Risk (ESSR) shall:
 - 1. Provide technical information and assist departments in implementing an effective fall protection program;
 - 2. Provide technical information and assist Facilities Management Capital and Campus Projects in designing controls for fall protection into projects;
 - 3. Provide and/or coordinate fall protection instruction as needed;
 - 4. Investigate and document all reported accidents that are related to fall hazards, recommending corrective actions; and
 - 5. Review and revise the Fall Protection Program, as needed for compliance with applicable regulations.

- B. Department of Facilities Management shall:
 - 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
 - 2. Operate the Work Control Center. Accept reports of hazards and either process work orders to correct the hazard or direct the request to another appropriate unit.

- C. Maryland Fire & Rescue Institute (MFRI) shall:
 - 1. Provide guidance and training to users of personal fall arrest systems.

- D. Deans, Directors, and Department Heads shall:
 - 1. Designate and empower individuals who will act as competent and/or qualified persons who will be responsible for the preparation and implementation of the Fall Protection Plan (See Appendix for Specific Duties of Competent Persons and Duties of Qualified Persons);
 - 2. Ensure that employees who will act as competent and/or qualified persons are adequately trained and/or qualified;
 - 3. Provide administrative and financial support for this program within individual departments; and
 - 4. Ensure the Fall Protection Program is implemented and maintained within the department.

- E. Designated Competent Persons shall:
 - 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; and
 - 5. 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.

- F. Designated Qualified Persons shall:
 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*.

- G. Supervisors shall:
 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
 2. Coordinate the correction of fall hazards brought to their attention by employees; and
 3. Complete a “First Report of Injury” report and produce any additional documentation needed to investigate and work related injuries and illnesses.

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

IV. Information

Assistance will be provided by ESSR to any department or individual requesting guidance or training to satisfy implementation of this policy.

Call ESSR at (301)405-3960 or send electronic mail to safety@umd.edu or view the ESSR home page at <http://www.essr.umd.edu>.

Glossary of Terms

Anchorage – a secure point of attachment for lifelines, lanyards or deceleration devices.

Anchorage Connector – used to join the connecting device (lanyard, lifeline, or deceleration device) to the anchorage.

Arresting Force – the force transmitted to the body when a fall is arrested. Also known as Fall Arrest Force.

Body Belt – a waist strap for attaching to a lanyard, lifeline or deceleration device. Used for positioning and/or restraint. Also known as a Safety Belt. Body belts are to be used as positioning devices and are not approved for personnel fall arrest systems.

Body Harness – a design of straps which is secured about a person in a manner to distribute fall arresting forces over at least the thighs, pelvis, waist, chest and shoulders, with provisions for attaching it to other components of a personal fall arrest system. Also known as a Full-Body Harness.

Body Wear – the personal protective equipment worn by a worker, such as a body belt or body harness.

Buckle – an integral connector used to attach straps or webbing segments together or to themselves.

Cam Buckle – an integral connector whereby the shoulder straps can be easily adjusted simultaneously with one hand. Promotes proper snug fit; will not slip or misadjust.

Friction Buckle – an integral connector whereby the webbing passes over the knurled bar and back down between the knurled bar and frame to adjust and tighten webbing straps.

Mating Buckle – an integral connector whereby a center bar is pushed through a square link. Webbing is then tightened for proper fit.

Tongue Buckle – an integral connector similar to a standard belt buckle whereby a webbing strap is inserted through the buckle placing the buckle tongue through the appropriate grommet hole. Also known as a Grommet Buckle.

Quick-Connect Buckle – for leg and chest harness straps that interlock similar to a seat belt for easy use and features a dual-tab release mechanism to prevent accidental opening.

Competent Person – one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

Connecting Device – the critical link which joins the body wear to the anchorage/anchorage connector, such as shock-absorbing lanyard, fall limiter, self-retracting lifeline, rope grab, etc.

Connector – a mechanism or device used to join together components of a personal fall arrest system or parts of a component within the system. See also Hardware.

D-Ring – an integral component or provision commonly found on body wear and some anchorage connectors which allows for attaching a connecting device (lanyard, lifeline, or deceleration device).

Deceleration Device – any mechanism which serves to dissipate energy during a fall arrest, limiting the forces imposed on a person.

Deceleration Distance – the additional vertical distance a falling person 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 a person’s body harness attachment point at the moment of activation (onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the person comes to a full stop.

Fall Indicator – a safety device or warning flag which serves to let a user know that a shock-absorbing lanyard has been involved in a fall and should be removed from service.

Fall Limiter – a self-retracting lifeline/lanyard with a quick-activating braking system that limits a free fall.

Free Fall – the act of falling before the personal fall arrest system begins to arrest the fall.

Free Fall Distance – the vertical distance a person falls before the fall arrest system begins to arrest the fall.

Full-Body Harness – (See Body Harness.)

Guard rail - A barrier erected to prevent personnel from falling to lower levels.

Hardware – buckles, D-rings, snap hooks and associated connectors which are used to attach components of a personal fall arrest system or parts of a component within the system.

Hole - A void or gap 2 inches or more in its least dimension in a floor, roof, or other walking/working surface.

Lanyard – a flexible line of rope, wire rope/cable, or webbing which generally has a connector at each end for securing a body belt or body harness to a lifeline, deceleration device or anchorage.

Lanyard Ring – a component of a body harness that allows the user to attach a lanyard when not in use so that it is not hanging freely.

Lifeline – a line provided for direct or indirect attachment to a body belt, body harness, lanyard, or deceleration device. Such lifelines may be horizontal or vertical in application.

Low-Slope Roof - a roof having a slope less than or equal to 4:12 (vertical to horizontal).

Lower Level – an area or surface to which a person can fall.

Minimum Safe Approach Distance - the closest distance an employee is permitted to approach an energized or a grounded object.

Maximum Arrest Force – the peak force on the body during arrest of a fall by the fall arrest system. Also known as Peak Fall Arrest Force.

One Hundred Percent Tie-off - connected to an anchor point 100% of the time with either dual lanyards, self-retracting lifelines or a combination of the two.

Personal Fall Arrest System – an arrangement of components that together will arrest a person in a fall from a working level. It typically consists of an anchorage, connecting device and body harness, and may include a lanyard, deceleration device, lifeline or a combination of these.

Personal Fall Limiter (PFL) – a self-retracting lanyard with a quick-activating braking system that limits a free fall. In addition, a PFL offers versatility through dual operation by either attaching directly to the harness back D-ring for use as a personal fall limiter, or can be used as a traditional retractable lifeline.

Qualified person - one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.

Retractable Lifeline – See Self-Retracting Lifeline/Lanyard.

Rollout – a process by which a snap hook, carabineer or similar device unintentionally disengages from another component to which it is attached.

Rope Grab – a deceleration device which travels on a lifeline and automatically engages the lifeline and locks to arrest a fall.

Scaffold - any temporary elevated or suspended platform, at its supporting structures, used for supporting employees or materials or both.

Trailing Rope Grab – a rope grab which moves freely up and down the lifeline with hands-free operation.

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 worker movement, and which, after onset of a fall, automatically locks the drum and arrests the fall. Refer to Fall Limiter.

Shock Absorber – a component of a personal fall arrest system which allows dissipation of energy by extending deceleration distance reducing fall arrest forces.

Shock-Absorbing Lanyard – specially-designed lanyard that elongates during a fall to significantly reduce fall arresting forces.

Snap Hook – a connector with a hook-shaped member, keeper, latch or other similar arrangement which may be opened to receive an object and, when released, automatically closes to retain the object.

Strap – a length of webbing.

Steep-Slope Roof - a roof having a slope greater than 4:12 (vertical to horizontal).

Stretchable Harness – a full-body harness that is more comfortable to wear because the webbing is a blend of nylon, polyester, and a specially-formulated elastomer that stretches. Includes provisions for attaching a lanyard, lifeline or deceleration device.

Sub-Pelvic Strap – a full-body harness strap, which passes under the buttocks without passing through the crotch, which is designed to transmit forces applied during fall arrest or post-fall suspension to the sub-pelvic part of the body.

Tie-Back Lanyard – a flexible line of heavy-duty, abrasion-resistant webbing designed to be used as the connecting device and anchorage connector with a specially-engineered snap hook able to withstand 5,000 lbs.

Total Fall Clearance Distance – the maximum vertical distance that a worker could potentially fall and still avoid contact with a lower level.

Total Fall Distance – the maximum vertical distance between the full-body harness attachment point and the lowest extremity of the body before and after the fall is arrested including lanyard extension and/or deceleration distance.

Walking/working surface - any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, form work and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Information and Training

- I. **University Employees who work on Ladders:** All University employees who use ladders shall be knowledgeable of the following:
 - A. How to inspect ladders for visible defects;
 - B. How to use ladders properly; and
 - C. Trained in ladder safety.

- II. **University Employees who use Fall Protection Personal Protective Equipment to control fall hazards in their work area:** All University employees who use personal fall protection equipment shall be knowledgeable of the following:
 - A. Service life of the full body harness and lanyards;
 - B. The proper hook-up, anchoring and tie-off techniques including determination of deceleration distances;
 - C. Methods of use; and
 - D. Inspection and storage of equipment.

- III. **University Employees who use Aerial Lifts:** Employees should receive training before using aerial lifts. Employees should be knowledgeable of the following:
 - A. The manufacturer's operating instructions;
 - B. Pre-start inspection of the lift;
 - C. Inspection of the work area for dangerous conditions such as uneven surfaces, overhead obstructions such as power lines, and severe weather;
 - D. Load capacities of the equipment;
 - E. How to safely move the equipment;
 - F. How to prevent falls and use appropriate fall protection personal protective equipment; and
 - G. Minimum safe approach distances to energized power lines.

- IV. **University Employees who work on Scaffolds:** Specific training is required in the following:
 - A. The nature of any electrical hazards, fall hazards and falling object hazards in the work area;
 - B. The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling the fall protection systems and falling object protection systems being used;
 - C. The proper use of the scaffold, and the proper handling of materials on the scaffold; and
 - D. The maximum intended load and the load carrying capacities of the scaffolds.

- V. **University Employees Assigned as Fall Protection Competent Persons:** Supervisors who act as the competent person for a work area or job site shall be trained and certified through a qualified fall protection training program (8 hours) to be qualified and knowledgeable of the following:

- A. The nature of falls in the work area;
- B. The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems used;
- C. The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;
- D. The role of each employee in the safety monitoring system when this system is used;
- E. The limitations on the use of mechanical equipment during the performance of roofing work on low sloped roofs;
- F. The correct procedures for the handling and storage of equipment and material, and the erection of overhead protection;
- G. The role of employees in fall protection plans; and
- H. The appropriate OSHA standards.

VI. University Employees Assigned as Scaffold Competent Persons: Supervisors who act as the competent person in the use of scaffolding shall be additionally trained and certified through a scaffold competent person training program (4 hours) to be qualified and knowledgeable of the following:

- A. The proper selection of scaffold for the task based upon the type of work to be conducted and the working load to be supported;
- B. The correct procedures for the erection of scaffolds;
- C. The correct procedures for the dismantling of scaffolds;
- D. The correct procedures for the moving of scaffolds;
- E. The correct procedures for the altering of scaffolds; and
- F. The OSHA standards.

VII. University Employees Assigned as Qualified Climbers: Employees who climb fixed ladders, step bolts or similar climbing devices on towers and poles shall use a means of fall protection and be tied-off to anchor points one hundred percent of the time. Employees who climb shall meet the following requirements:

- A. Shall be physically capable;
- B. Shall have successfully completed a training or apprenticeship program that covers hands-on training for the safe climbing of ladders or step bolts; and
- C. Shall be protected by a fall protection system when reaching their work position. Employees will require retraining under any of the following conditions:
 1. Changes in the workplace render previous training obsolete;
 2. Changes in the types of fall protection systems or equipment to be used render previous training obsolete; or
 3. Inadequacies in an employee's knowledge of use of fall protection systems or equipment or observed behavior indicate that the employee has not retained the required training.

ESSR shall maintain a written training certification record containing the name of the employee trained, the name of the person who conducted the training, and the date of the training for Competent Persons in Fall Protection and Scaffolds, and Qualified Climber. The written certification record shall contain the name of the employee trained and the date of training. Departments can call ESSR at (301)405-3960 for more information on training requirements, costs, and scheduling.

Fall Hazards

Each department shall be responsible to inspect for potential fall hazards and to have each potential fall hazard evaluated by a competent person.

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. The following are fall hazards which require protection.

- 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.

Protection from overhead falling hazards must be provided.

- Placement of toe boards and the use of hard hats shall be required.
- Equipment shall not be stored within four feet of an unprotected edge.
- Canopy structures may be required in high traffic areas.
- The area to which objects could fall must be barricaded and individuals not equipped with hard hats prohibited from entering.

Engineering Controls

Departments shall have a competent person determine if engineering controls can eliminate or lessen the hazard of the work area or job site. Engineering controls shall be provided where possible to minimize fall hazards. Engineering controls of fall hazards consist of the following:

- I. Guardrails, Parapets and Toe boards:** These requirements apply to temporary controls on job sites as well as permanent fixtures in general work areas. The *State of Maryland Fire Prevention Code* carries requirements that may be more stringent for permanent guardrails.
- A. A standard railing consists of a top rail, mid rail, and posts and is forty-two inches, plus or minus three inches (42"±3") high from the top of the rail to the floor, platform, runway or ramp. Nominal height of the mid rail is 21 inches;
 - B. 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;
 - C. The anchoring of posts and framing of members for railings of all types must be of such construction that the completed structure is capable of withstanding a load of 200 pounds applied in any direction at any point on the top rail;
 - D. Guardrail systems have a surface that prevents injuries such as punctures and lacerations and prevents snagging of clothing; and
 - E. When guardrail systems are in hoisting areas, a chain gate or removable guardrail section shall be in place when not being used.

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.

II. Skylights

- A. 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
- B. 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.

III. Covers

- A. 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;
- B. 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;
- C. All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees;
- D. Covers shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard when it is not readily apparent; and

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- E. 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.

Fall Protection Personal Protective Equipment

Personal protective equipment shall be used to minimize fall hazards where engineering controls do not eliminate the hazard or in conjunction with engineering controls.

Fall protection equipment is divided into five functional categories: 1. Fall Arrest, 2. Positioning Device, 3. Suspension, 4. Retrieval and 5. Restraint.

I. Fall Arrest

The use of a personal fall arrest system is the required personal protective equipment for fall hazards at the University of Maryland. 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.

University of Maryland 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:

- A. **Body Harness** - Only full-body harnesses shall be used. The use of a body belt as fall protection is prohibited.
- B. **Connecting Device** - Shock-absorbing lanyards and lifelines
 1. Lanyards and lifelines shall have a minimum breaking strength of 5000 pounds;
 2. Lanyards shall not exceed six feet in length. Lanyards used on aerial lift devices should not exceed 4 feet in length to reduce slack;
 3. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses shall be made from synthetic fibers;
 4. Connecting assemblies shall have a minimum tensile strength of 5,000 pounds;
 5. 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);
 6. Personal fall arrest systems shall limit the maximum arresting forces to 1800 pounds with a full body harness;
 7. The maximum free fall distance is six feet for all systems;
 8. The maximum deceleration distance is 3.5 feet;
 9. Personal fall arrest systems shall have sufficient strength to withstand twice the potential impact energy of the falling employee;
 10. Lifelines shall be protected against cutting and abrasions;
 11. 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; and

12. 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.
- C. **Anchorage** - Anchorage point and anchorage connector
 1. 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;
 2. A qualified person shall determine all anchor points, both temporary and permanent. Permanent anchor points shall be properly marked;
 3. Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other regulations.

II. Positioning Device

A positioning device is not a substitute for a personal arrest system and is limited to use as 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.

Where positioning device is used, it shall comply with the following:

- A. Positioning devices shall be rigged such that a free fall cannot be more than 2 feet; and
- B. Positioning devices shall be secured to an anchorage point capable of supporting at least twice the potential impact load of an employee's fall or 3,000 lbs., whichever is greater.

III. Suspension

Personal suspension systems are used for window washing and painting and are designed to lower and support a worker to perform tasks. The components of a suspension system are:

- A. Full-Body Harness;
- B. Work line;
- C. Anchorage; and
- D. Positioning device such as a boatswain's chair.

A boatswain's chair system is considered a single-point adjustable suspended scaffold.

Since the suspension system components are not designed to arrest a free fall, a backup fall arrest system shall be used in conjunction with the personal suspension system that would activate only if the worker were to experience a free fall.

IV. Retrieval

Personal retrieval systems are used for confined space entry and on-entry rescue. Refer to the University of Maryland *Confined Spaces Plan* for information on confined spaces entry. Personal retrieval systems consist of the following:

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- A. Full body harness;
 - B. Retractable lifeline/rescue unit; and
 - C. Tripod with winch.

V. Restraint

A restraint line is a device which is attached between the employee and an anchorage point to prevent the employee from walking or falling off an elevated surface. It does not support an employee at an elevated surface, but rather, prevents the employee from leaving the elevated surface or work position.

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. Refer to the *UM Personal Protective Equipment Program* for more information.

Equipment Inspections and Maintenance

I. 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.

II. 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.

III. 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.

Roofing

The hazards associated with work on roofs includes falling through openings and falling off edges. The protection of openings is discussed in the engineering controls section of this program.

Effective roof work fall protection techniques are intended to protect workers while providing the mobility and comfort necessary to perform work tasks. Several techniques are available and are described below.

I. Low-slope or Flat Roofs (slope less than or equal to 4:12 vertical to horizontal)

Each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by guardrail systems, parapets, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet or less in width the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

II. Steep roofs (slope greater than 4:12 vertical to horizontal)

Each employee on a steep roof with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by guardrail systems with toe boards, safety net systems, or personal fall arrest systems.

III. Personal Fall Arrest System

- A. The system of choice for fall protection on roofs is the personal fall arrest system;
- B. Requirements for personal fall arrest systems are found in the Fall Protection Personal Protection Equipment section of this program; and
- C. Personal fall arrest systems for roof work must be designed by a qualified person.

IV. Designated Areas

As an alternative to installing guardrails, a designated area may be established. Designated areas are of a temporary nature only. The following condition and requirements must be met in order to use designated areas in lieu of other fall protection measures:

- A. The work must be of a temporary nature, such as maintenance on roof top equipment;
- B. Designated areas shall be established only on surfaces that have a slope from horizontal of 10 degrees or less; and
- C. The designated area shall consist of an area surrounded by a rope, wire, or chain and supporting stanchions.
 - 1. Shall be constructed with ropes, wires or chains of 500-lb tensile strength. Barrier tape is strictly prohibited;
 - 2. The warning line system of the designated area will have uprights capable of withstanding withstand 16-lb force at 30-in. height. The line will be of rope, wire, chain of 500-lb tensile strength. The line shall be flagged at 6-ft intervals. Height of the warning line shall be 34-39 inches. The line will be attached to uprights with no line slip;

3. After being erected with the line attached, stanchions shall be capable or resisting, without tipping over, a force of at least 16 pounds applied 30 inches above the base;
4. 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;
5. The line forming the designated area shall be clearly visible from any unobstructed location within the designated area up to 25 feet away;
6. The stanchions shall be erected as close to the work area as is permitted by the task;
7. The perimeter of the designated area shall be erected no less than 6 feet from the unprotected side or edge; and
8. Access to the designated area shall be by a clear path formed by two lines attached to stanchions.

Scaffolds

I. Use of 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.

III. Maintenance of Scaffolds

All scaffold repairs must be done by a qualified person.

IV. Storage of Scaffolds

Scaffolds should be disassembled prior to storage. Scaffolds should be stored where they can be inspected easily and can be reached without causing accidents. The storage area should be well ventilated and away from sources of heat and moisture.

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.

II. Minimum Safe Approach Distances (M.S.A.D)

The minimum safe approach distances to energized power lines and parts must be maintained.

NFPA 70 E TABLE 130.2 (C)

NOMINAL SYSTEM VOLTAGE RANGE	LIMITED APPROACH BOUNDARY	LIMITED APPROACH BOUNDARY	RESTRICTIVE APPROACH BOUNDARY	PROHIBITIVE APPROACH BOUNDARY
PHASE TO PHASE	EXPOSED MOVABLE CONDUCTOR	EXPOSED FIXED CIRCUIT	INCLUDES INADVERTENT MOVEMENT ADDER	INCLUDES REDUCED INADVERTENT MOVEMENT ADDER
LESS THAN 50 V	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED
50 TO 300 V	10 FEET 0 INCH	3 FEET 6 INCH	AVOID CONTACT	AVOID CONTACT
301 TO 750 V	10 FEET 0 INCH	3 FEET 6 INCH	1 FEET 0 INCH	0 FEET 1 INCH
751 TO 15 KV	10 FEET 0 INCH	5 FEET 0 INCH	2 FEET 2 INCH	0 FEET 7 INCH
15.1 TO 36 KV	10 FEET 0 INCH	6 FEET 0 INCH	2 FEET 7 INCH	0 FEET 10 INCH
	DISTANCE IN FEET AND INCHES OF THE ENERGIZED PART FROM THE PERSONNEL			

Portable Ladders

I. Use of Portable Ladders

The proper ladder must be selected for the task. General rules include the following:

- A. The ladder chosen must be long enough to provide access to the work area without necessitating standing on the top two steps of a stepladder or the top three rungs of a straight ladder;
- B. The ladder selected must be sufficient for the weight of the employee plus the weight of any tools and materials:
 - 1. TYPE 1A-Extra-heavy industrial ladder will support 300 lbs.
 - 2. TYPE 1-Heavy-duty industrial ladder will support 250 lbs.
 - 3. TYPE 2-Medium-duty commercial ladder will support 225 lbs.
 - 4. TYPE 3-Light-duty household ladder will support 200 lbs.
- C. When a straight ladder is used to gain access to a roof, the side rails should extend at least three feet above the support point at the eave, gutter, or roof line;
- D. Never splice together short ladders to form a longer ladder;
- E. Never place ladders on boxes, barrels, or other unstable bases for additional height;
- F. Ladders must be placed on level surfaces. Although ladder feet or shoes provide an important measure of safety, they cannot compensate for uneven ground unless they are designed with adjustable feet;
- G. Be alert to slippery surfaces. Nonslip bases are not a substitute for safety in placing, lashing, or holding a ladder on oily, metal, concrete, or other slippery surfaces;
- H. Do not use ladders for unintended purposes;
- I. Do not use a metal ladder when working on or near electrical equipment;
- J. The distance from the bottom of a straight ladder to its support wall shall be one-quarter the working length of the ladder or 4:1 ratio vertical to horizontal;
- K. Where possible, straight ladders should be secured with a rope or wire at the top and blocked at the bottom;
- L. The top two steps and platform of a stepladder shall not be used, and the top three rungs of a straight ladder shall not be used;
- M. Do not over-reach, jump or slide a ladder while on it. Ladders shall not be moved, shifted, or extended while occupied;
- N. Always face the ladder using both hands while ascending or descending.
- O. Tools or materials should be raised by means of a rope after the climber has reached the working position. Carrying heavy loads up or down ladders is prohibited;
- P. Barricades and warning signs should be posted when ladders are placed near doors or other locations where they could be struck;
- Q. Two workers shall handle and set up all extension ladders;
- R. Ladders should not be used by more than one person at a time unless they are designed for such use;
- S. The bracing on the back side rails of stepladders is designed only for increasing stability, not for climbing;
- T. Ladders shall not be used horizontally as platforms, runways, or scaffolds. Extension ladders must have proper overlap.
 - 1. Three foot overlap for 32 foot ladder;
 - 2. Four foot overlap for 32 to 36 foot ladder;
 - 3. Five foot overlap for 36 to 48 foot ladder; and
 - 4. Six foot overlap for 48 foot ladder

- U. Make certain that both automatic locks of the extension ladder are in proper position before ascending the ladder;
- V. Straight ladders and stepladders that exceed 10 feet may be held by another person for steadying;
- W. The area around the top and bottom of the ladder shall be kept clear; and
- X. Hard hats must be worn within an area beneath elevated work where objects could fall from a height and strike a worker.

II. Inspection of Ladders

Prior to use of any ladder, an inspection must be performed:

- A. Carefully examine the ladder for broken or missing rungs or cleats, broken side rails, and other damaged parts;
- B. All cleats, rungs, and side rails must be free of grease, oil, paint, or other slippery substances;
- C. The ladder should be equipped with feet that are secured in place;
- D. The joint between steps and side rails must be tight, and all hardware and fittings should be attached firmly. Movable parts should operate freely without binding or undue play;
- E. All wood parts must be free of sharp edges and splinters;
- F. Visually inspect the ladder to be free of shakes, warpage, decay or other irregularities;
- G. Metal ladders must be free of sharp edges, burrs and corrosion;
- H. Inspect for dents or bends in side rails, rungs or cleats;
- I. Check step to side rail connections, hardware connections and rivets; and if a ladder tips over, inspect the ladder for damage before continuing work.

III. Maintenance of Ladders

Damaged ladders must be withdrawn from service and either repaired or destroyed. When a defect or unsafe condition is found, personnel should tag or mark the ladder so that it will not be used until the corrective action is taken. Defective or unsafe conditions must be reported to the supervisor. Field repairs and the fabrication of improvised ladders is prohibited. Never try to straighten a bent or bowed ladder. Remove it from service immediately. Do not paint wooden ladders with solid color paints. This may mask cracks in the wood and make them hard to see. Clear wood preservative can be used to protect bare wood.

If exposed to greases, oils or other slippery substances, the ladder must be cleaned of the substance with solvents or steam. If the slippery substance is not completely removed, the ladder must be removed from service.

IV. Storage of Ladders

Ladders should be stored where they can be inspected easily and can be reached without causing accidents.

Fixed Ladders and Stairs

I. Fixed Ladders

- A. Fixed ladders should be designed to withstand a single concentrated load of at least 200 lbs.;
- B. Rungs of metal ladders must have minimal diameter of three quarters inch. Rungs must be at least 16 inches wide, be spaced 12 inches apart;
- C. Fixed Ladders, when their location so demands, must be painted or treated with a preservative to resist deterioration;
- D. The preferred pitch for a safe descent is 75 to 90 degrees. Ladders with 90 degree pitch must have two and one half feet of clearance on the climbing side. There must be a three foot clearance on ladders with a 75 degree pitch;
- E. There must be at least a seven inch clearance in back of the ladder to provide adequate toe space;
- F. There must be a clear width of 15 inches on each side of the center line of the ladder, unless the ladder is equipped with a cage or well;
- G. Fixed ladders must have cages if they are longer than 20 feet. Landing platforms must be provided on ladders greater than 20 feet long. A platform is required every 30 feet for caged ladders and every 20 feet for unprotected ladders; and
- H. Side rails must extend at least 42 inches above the landing.

II. Fixed industrial stairs

The following applies to all stairs around equipment, machinery, tanks etc. They do not apply to stairs used for fire exits:

- A. Riser height and tread width of fixed industrial stairs should be uniform throughout any flight of stairs. All treads must be reasonably slip resistant;
- B. The minimum permissible width of a stairway is 22 inches;
- C. The angle to the horizontal made by the stairs must be between 30 and 50 degrees;
- D. All stairs should be adequately lighted; and
- E. If the tread is less than 9 inches wide the risers should be open.

III. Flights of stairs having four or more risers

The *State of Maryland Fire Prevention Code* also carries requirements for stairs.

- A. A stair railing is required on each opened side;
- B. If the stairway is less than 44 inches wide and both sides are enclosed, at least one handrail is required, preferably on the right side descending;
- C. If the stairway is greater than 44 inches wide a handrail is required on each enclosed side;
- D. If the stairway is greater than 88 inches wide an intermediate stair railing located midway is required;
- E. The vertical height of a stair railing must be 30 to 34 inches, and it must be of construction similar to the standard guard railing; and
- F. Spiral stairways are not permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.

IV. Embedded Stairs

- A. Individual steps used for access or egress, embedded in the walls of risers or the conical top sections of manholes must be safe, well-constructed, and installed in accordance with good engineering practices;
- B. Individual rungs or steps must be uniformly spaced from 12 to 16.5 inches; and
- C. The use of steps in personal access holes should be designed to prevent the foot from sliding off the end.

V. Alternating Tread Stairs

Alternating tread type stairs are permitted if they are installed, used, and maintained according to the manufacturer's recommendations:

- A. The stair must be installed at an angle of 70 degrees or less; and
- B. The stairs must be equipped with a handrail at each side to assist the workers in climbing or descending.

Walking and Working Surfaces

In general, all areas of the workplace should be kept clean, orderly sanitary, and as dry as possible. These guidelines apply to work areas, passageways, store rooms, and service rooms:

1. All spills should be cleaned promptly. Floors in work areas must be kept free of scraps, chips, oil spills, and other debris;
2. Boxes, chairs, buckets, desks or any other device not specifically intended for use in extending reach shall not be used;
3. Areas which are constantly wet should have non-slip surfaces or mats where workers may walk or work. Where wet processes are used good drainage must be maintained;
4. Every floor, working place, and passageway must be maintained free from protruding nails, splinters, holes, and loose boards;
5. Where mechanical handling equipment is used, such as lift trucks, sufficient safe clearance must be provided for foot and vehicular traffic;
6. No obstructions that could create a hazard are permitted in aisles. All permanent aisles must be easily recognizable; and
7. As a general condition, a standard toe board and guard rail are required where ever people walk near or beneath the open sides of a platform or similar structures; where things could fall from a structure; or where things could fall from a structure into machinery below.

Appendix I Duties Requiring a “Competent Person”

Subject	Standard	Activity
Scaffolds	1926.450	Competent person means a person who, because of training and experience, is capable of identifying hazardous or dangerous conditions, of training employees to identify such conditions, and who has authorization to take prompt corrective measures to eliminate them.
Walking-Working Surfaces	1910.28	Erect tube and coupler scaffolds
Walking-Working Surfaces	1910.28	Erect tubular welded frame scaffolds
Walking-Working Surfaces	1910.28	Mason’s adjustable multiple-point suspension scaffolds shall be installed or relocated in accordance with instruction of a registered professional engineer and supervised by a competent person
Walking-Working Surfaces	1910.28	Stone setters’ adjustable multiple point suspension scaffolds shall be installed or relocated in accordance with instruction of a registered professional engineer and supervised by a competent person
Fall Protection	1926.502	Certify safety net systems
Fall Protection	1926.502	Inspect personal fall arrest systems and components subjected to impact loading immediately after use to determine if they are undamaged and suitable for use.
Fall Protection	1926 502	Perform the duties of the Safety Monitor when a Safety Monitor System is used
Fall Protection	1926.502	Supervise the implementation of a fall protection plan prepared by a qualified person when conventional fall protection equipment is infeasible.
Fall Protection	1926.503	Provide training to employees who are exposed to fall hazards
Scaffolds	1926.451	Supervise the erection, movement, dismantling, or altering of all scaffolds. The competent person shall determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds.
Scaffolds	1926.451	Inspect scaffolds and scaffold components before each work shift and after any occurrence which could affect a scaffold’s structural integrity
Scaffolds	1926.451	Supervise the installation and relocation of mason’s adjustable multiple-point scaffold.
Telecommunications	1910.268	Inspect personal protective devices, tools and equipment
Telecommunications	1910.268	Inspect and check ladders for adequate strength, good condition and that they are secured properly

Appendix II

Duties Requiring a “Qualified Person”

Subject	Standard	Activity
Scaffolds	1926.450	Qualified person means one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.
Walking-Working Surfaces	1910.30	Only the manufacturer of a scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height
Scaffolds	1926.451	Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design.
Scaffolds	1926.454	Each employee who performs work while on a scaffold shall be trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control hazards
Fall Protection	1926.503	A fall protection plan (used when conventional fall protection equipment is infeasible) shall be prepared by a qualified person and developed specifically for the site.
Fall Protection	1926.502	Anchorage used for personal fall arrest systems shall support at least 5000 pounds per employee or shall be designed, installed and used under the supervision of a qualified person.