

Fall Protection

University of Tennessee Safety Program GS-041

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Purpose

The purpose of this program is to outline the fall protection requirements to minimize/eliminate fall related injuries. This Fall Protection Program prescribes the duty to provide fall protection; sets the criteria and practices for fall protection; and outlines required training and recordkeeping. This program is developed in accordance with the Occupational Safety and Health Administration (OSHA) regulations.

Scope and Applicability

This plan shall apply to students, staff, and faculty whose work duties require them to work at unprotected heights greater than four (4) feet. On campus facilities shall be included plus situations where students, staff or faculty could be exposed to a fall hazard while engaged in offsite university-sponsored activities. The use of ladders, scaffolds, and aerial lifts are not covered in detail within this program.

This program does not apply to the following situations:

- Recreational or athletic events including rock climbing, sky diving, competitive diving, hang gliding, and similar activities.
- Where climbing gear is used.
- Stairs or fall hazards on the same level (covered in the UT Slips, Trips and Falls Guidance document, GS-040)

Abbreviations and Definitions

Abbreviations

ANSI – American National Standards Institute

CFR – Code of Federal Regulations

EHS – campus Environmental Health and Safety

GFCI- ground fault circuit interrupter

NFPA – National Fire Protection Association

OSHA - Occupational Safety and Health Administration

Definitions

Elevated walking surface: is a location where an individual could stand and is more than four feet above an adjoining surface.

Extreme fall hazard: these are locations and situations where a fall is likely and the resulting injuries could

be fatal.

Fixed ladders: ladder that are permanently attached (e.g. bolted, anchored) to a building or structure.

Holes: include HVAC floor openings, trap doors, temporary openings in the walking surface for construction or maintenance, skylights, man hole covers, and alike. The minimum area defining a hole is one square foot. Note that a smaller limit may be necessary for locations where children are present.

Personal Fall Arrest System: consists of a full body harness, D-ring connector, lanyard and a suitable anchor point. Other components may include horizontal life line, self-retracting lift line, positioning belt, and shock absorbing lanyard.

Roles and Responsibilities

Environmental Health and Safety will:

- Maintain this written plan and place in the online safety manual
- Assist with interpretation of the plan
- Conduct site reviews, including complaint follow up, upon request
- Assist departments or individuals to the extent feasible with compliance
- Maintain records as required
- Provide training upon request
- Investigate accidents involving falls
- Disseminate information related to fall hazard prevention as necessary

Departments that may have individuals who are exposed to a fall hazard shall:

- Ensure the individuals are trained as appropriate
- Consult with Environmental Health and Safety when specific questions arise related to this plan
- Report any deficiencies or problems
- Maintain records as required
- Ensure site-specific fall prevention plans are developed if necessary.
- Ensure specific fall hazards are identified and adequately controlled through engineering and/or administrative controls.
- Ensure that all personnel are aware of the locations or equipment where fall protection measures are required;

Individuals who may be exposed to a fall hazard shall:

- Report any accidents, hazards or near misses associated with fall hazards to their supervisor or EHS
- Use recognized safe work practices associated with ladders, personal fall arrest systems, nets, scaffolding and powered lifts.
- Participate in training as necessary

Procedures

EHS shall conduct safety inspections to identify fall hazards on campus and make recommendations as necessary.

Extreme fall hazard shall be considered imminent danger. Any staff or faculty member is authorized to stop work when these situations are encountered. See Safety Procedure AD-023 (Imminent Danger) in the UTK

safety manual for additional details.

Fall Prevention Plan – A site specific plan is available only for employees engaged in leading edge work, precast concrete erection work, or residential construction work (See 1926.501(b)(2), (b)(12), and (b)(13)) who can demonstrate that it is infeasible or it creates a greater hazard to use conventional fall protection equipment.

Signs may be used to warn of a fall hazard, but shall not be the sole means of protection.

Areas or Activities That Require Fall Protection

OSHA has identified 15 areas or activities where some type of fall protection is needed if the potential fall distance is six feet or greater. The following are situations where fall protection is needed. Please keep in mind there may be other situations where a fall of 6 feet or more is possible.

Unprotected Sides and Edges

Employees on a walking/working surface with an unprotected side or edge that is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems or personal fall arrest systems. All employees shall be instructed on the necessary precautions prior to conducting inspections, investigations, or assessments.

Leading Edges

Employees constructing a leading edge that is 6 feet or more above a lower level shall be protected by guardrail systems or personal fall arrest systems. Any employee on a walking/working surface 6 feet or more above a lower level where leading edges are under construction, but the employee is not performing the leading edge work, shall be protected from falling by a guardrail system or personal fall arrest system. If a guardrail system is chosen to provide the fall protection, and a controlled access zone has already been established for leading edge work, the control line may be used in lieu of a guardrail along the edge that parallels the leading edge.

Hoist Areas

Each employee in a hoist area shall be protected from falling 6 feet or more to lower levels by guardrail systems or personal fall arrest systems. If a guardrail system or portion(s) of the system is removed to hoist objects and the employee must lean through the access opening or out over the edge, that employee shall be protected by using a personal fall arrest system.

Openings/Holes

Each employee on walking/working surfaces shall be protected from falling through openings/holes (including skylights and roof penetrations) more than 6 feet above lower levels, by personal fall arrest systems, covers, or guardrails erected around the holes/openings. Each employee shall be protected from tripping or stepping into or through openings/holes by use of hole covers of standard strength and construction. Each employee on a walking/working surface shall be protected from objects falling through openings/holes from above.

Formwork and Reinforcing Steel

Each employee on the face of formwork or reinforcing steel shall be protected from falling 6 feet or more to lower levels by personal fall arrest systems or positioning device systems.

Ramps, Runways, Platforms, and Other Walkways

Each employee on ramps, runways, and other walkways shall be protected from falling 6 feet or more to lower levels by guardrail systems or personal fall arrest systems.

Excavations

Each employee at the edge of an excavation, pit, well, or shaft 6 feet or more in depth shall be protected from falling by guardrail systems, fences, barricades, or covers. Excavations less than 6 feet deep shall be marked with barrier tape and appropriate warning signs.

Dangerous Equipment

Each employee working above dangerous equipment regardless of height shall be protected from falling into or onto equipment by guardrail equipment or by equipment guards. Each employee 6 feet or more above dangerous equipment shall be protected from fall hazards by guardrail systems or personal fall arrest systems.

Overhand Bricklaying and Related Work

Each employee performing overhand bricklaying and related work 6 feet or more above lower levels, shall be protected from falling by guardrail systems, personal fall arrest systems, or shall work in a controlled access zone. Any employee reaching more than 10 inches below the level of the walking/working surface on which they are working shall be protected from falling by a guardrail system or personal fall arrest system.

Low Slope Roofs

Employees performing roofing activities on low-slope roofs with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by the following systems:

- Guardrail systems;
- Personal fall arrest systems;
- Or a combination of the following:
 - Warning line system and guardrail system;
 - Warning line system and personal fall arrest system;
 - Warning line system and safety monitoring system.

Steep Roofs

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 toeboards or personal fall arrest systems.

Precast Concrete Erection

Each employee engaged in the erection of precast concrete members and related operations working 6 feet or more above lower levels shall be protected from falling by guardrail systems or personal fall arrest systems.

Wall Openings

Each employee working on, at, above, or near wall openings where the outside bottom edge is six feet or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches above the walking/working surface, shall be protected from falling. This protection shall be provided through the use of guardrail systems or a personal fall arrest system.

Protection from Falling Objects

When an employee is exposed to falling objects, IUPUI requires that each employee wear a hard hat and implement one of the following measures:

- Erect toe boards, screens, or guardrail systems to prevent objects from falling from higher levels;
- Erect a canopy structure and keep potential falling objects far enough from the edge of the upper level

- Barricade the area where overhead objects could fall and prohibit employees from entering the area.

Walking/Working Surfaces Not Addressed

If the specific activity was not addressed above, each employee on a walking/working surface 4 feet or more above a lower level shall be protected by a guard rail system or personal fall arrest system.

Note: Contractors are required to prepare and implement a Fall Protection Plan when necessary.

Other Activities Requiring Fall Protection

The activities listed below are not covered under 29CFR 1926.500. Fall Protection requirements are addressed in the specific standard listed below:

- Scaffolds, 1926 Subpart L;
- Cranes and Derricks, 1926 Subpart N;
- Steel Erection Work, 1926 Subpart R;
- Tunneling Operations, 1926 Subpart S; and
- Working on Stairways and Ladders, 1926 Subpart X.

All fall protection systems used at UTK shall meet the requirements of 29 CFR 1926.502 "Fall Protection Systems Criteria and Practices

Fall Protection Requirements – General Industry/Maintenance Activities

Note: A specific Fall Protection Standard does not exist for general industry. Some Fall Protection Program requirements are contained in industrial specific standards and are addressed below.

Floor Openings

Stairway floor openings shall be guarded by a standard railing and toeboard. Ladderway floor openings or platforms shall be guarded by a standard railing and toeboard on all exposed sides.

Hatchway and chute floor openings shall be guarded by either a hinged floor cover of standard strength and construction with standard railing or a removable railing with toeboard on not more than two sides and fixed standard railings with toeboards on all other exposed sides.

Skylight floor openings and holes shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.

Pit and trap door floor openings, infrequently used, shall be guarded by a cover of standard strength and construction. While the cover is not in place, the pit or trap door openings shall be constantly attended by someone or shall be protected on all sides by removable standard railings.

Manhole floor openings shall be guarded by a standard manhole cover. While the cover is not in place, the manhole shall be constantly attended by someone or shall be protected by removable standard railings.

Temporary floor openings shall have standard railing or be constantly attended by someone.

Floor holes in which persons can accidentally walk into shall be guarded by standard railing with toeboards on all exposed sides or shall be guarded by a cover of standard strength and construction. While the cover is not in place, the hole shall be constantly attended by someone.

Floor holes in which persons cannot accidentally walk into (because of fixed machinery or equipment) shall be

protected by a cover that leaves no openings more than 1 inch wide. The cover shall be held securely in place to prevent tools or materials from falling through.

Wall Openings and Holes

Wall openings from which there is a drop of more than 4 feet shall be guarded by a rail, picket fence, half door or equivalent barrier. Removable toeboards shall be used when there is an exposure below to falling material.

Chute wall openings where there is a drop of more than 4 feet shall be guarded by a rail, picket fence, half door or equivalent barrier.

Window wall openings at a stairway landing, floor, platforms, or balcony from which there is a drop of more than 4 feet, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work or standard railing. If the window opening is below the landing or platform, a standard toeboard shall be provided.

Temporary wall openings shall have adequate guards but these do not need to be made of standard construction.

Where there is a hazard of materials falling through a wall hole, standard toeboards or an enclosing screen shall be installed.

Protection of Open Sided Floors, Platforms and Runways

Open sided floors, platforms, or runways 4 feet or more above the adjacent floor or ground level shall be guarded by a standard railing on all open sides except when there is an entrance to a ramp, stairway, or fixed ladder. Toeboards are required where persons can pass below, there is moving machinery, or there is equipment, which could create a hazard.

Regardless of height, floors, walkways, platforms or runways located above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units and similar hazards shall be guarded with standard railing and toeboards.

Fixed Industrial Stairs

Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails. Standard railings shall be installed on the open sides of all stairways and stair platforms, which are located four or more feet above a lower level even if there are less than four risers in the flight of stairs

Fixed Ladders

Ladder safety devices (life belts, friction brakes, sliding attachments) are required on tower, water tanks and chimney ladders that are over 20 feet, unless cage protection is provided. See UTK's Ladder Safety Program (GS 73) Fixed ladders 20 or more feet in height shall have a personal fall arrest system. Note that existing ladders more than 20 feet in height may use a cage as defined by the 29 CFR 1910.27(d).

Portable Ladders

Users must be able to recognize and avoid ladder hazards and be aware of safe practices in setting up, storing, and working with ladders. See UTK's Ladder Safety Program (GS 73)

Scaffolds

Guardrails, midrails, and toeboards shall be installed on open sides of scaffolds which are 10 feet or greater in

height. Full body harnesses and lifelines are required for suspension scaffolds and boatswains chairs.

1. Scaffolding shall be in accordance with the OSHA construction standard (29 CFR 1926 Subpart L) or General Industry (29 CFR 1910.28) and the manufacturer's specifications. Note there are many different types of scaffolding.
2. Shall be installed by trained individuals and inspected periodically.
3. May require the use of personal fall arrest system based on the nature of the work.

Aerial Lifts

Employees working in a bucket truck or boom lift are required to wear a full body harnesses and lanyards.

Elevated Walking or Working Surfaces

Fall hazards from these locations shall be controlled by one of the following:

1. **Guardrail** constructed in accordance with NFPA standards or the building code with respect to strength (200 lbs.), rail height (42 inches minimum), and mid-rail or baluster spacing (maximum 4 inch clear width). Note that OSHA guardrails, detailed in 29 CFR 1910.23 may be used for limited situations or for existing situations where children under the age of 12 are unlikely to be present. Work on a ladder adjacent to a guardrail may negate the protective feature of the rail and should be addressed before work starts.
 - a. Guardrail systems shall meet the following criteria:
 - b. Toprails and midrails of guardrail systems shall be at least one quarter inch in diameter;
 - c. If wire rope is used for toprails, it shall be marked every six feet with highly visible material;
 - d. Steel or plastic banding material shall not be used as toprails or midrails;
 - e. Manila, plastic or synthetic rope used for toprails or midrails shall be inspected frequently to ensure strength and stability;
 - f. The top edge height of toprails or guardrails shall be 42 inches plus or minus three inches above the walking level;
 - g. When workers are using stilts, the top edge height of the top rail or equivalent shall be increased equal to the height of the stilts;
 - h. Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there are no walls or parapet walls at least 21 inches high;
 - i. When midrails are used, they shall be installed at a height midway between the top edge of the guardrail system and the walking/working level;
 - j. When screens and mesh are used they shall extend from the toprail to the walking/working level and along the entire opening between top rail supports;
 - k. Intermediate members, such as balusters, when used between posts, shall not be more than 19 inches apart;
 - l. Other structural members, such as additional midrails and panels, shall be installed so that there are no openings larger than 19 inches;
 - m. The guardrail system shall be capable of withstanding a force of at least 200 pounds;
 - n. Midrails, screens, mesh, intermediate vertical members, solid panels and equivalent structural members shall be capable of withstanding a force of at least 150 pounds;
 - o. Guardrail systems shall have smooth surfaces to protect employees from punctures or lacerations and prevent clothing from snagging;
 - p. The ends of toprails and midrails shall not overhang terminal posts, except where such overhang

does not constitute a projection hazard;

- q. A chain gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place;
 - r. At holes, six feet or more in depth, guardrail systems shall be set up on all unprotected sides or edges and all holes shall be covered when not in use;
 - s. Guardrail systems with a gate shall be used around holes that are access points to prevent employees from falling into these holes; and
 - t. If guardrail systems are used at the sides or edges of ramps and runways, they shall be erected on each side or edge.
2. **Personal Fall Arrest Systems** – must be installed and used in accordance with the manufacturer’s specifications.
 3. **Nets** – in accordance with the OSHA construction standard (29 CFR 1926.105) or applicable ANSI standards.
 4. **Warning Line** – generally available only on construction sites with various limitations. See the OSHA construction Standard (29 CFR 1926.502(f)).
 5. **Controlled Access Zones** - generally available only on construction sites with various limitations. See the OSHA construction standards (29 CFR 1926.502(g)).
 6. **Safety Monitoring System** - generally available only on construction sites with various imitations. See the OSHA construction standards (29 CFR 1926.502(h))

Boatswain Chair

- Shall be used in accordance with the manufacturer’s specifications.
- Open Pits and Excavations
- Fall hazard shall be guarded with a fence or barriers when unattended.
- Signs shall be posted warning of the hazard at intervals not to exceed 50 feet around the perimeter of the fence or barrier.

Holes in the Walking Surface

Holes shall be guarded with any of the following:

- Floor grate, screen or temporary cover of sufficient strength to carry twice the anticipated load.
- Where a cover or grate is not feasible, other methods (guardrails, barriers, warning lines) shall be used.
- Covers shall be secured to prevent movement and require marking if located on a construction site.

Towers, Light Poles and Alike:

- A mechanical lift is the preferred method to access to the upper level of towers, light poles, and similar structures.
- Towers, light poles and alike that are metallic may be conductive. It may be necessary to use electrical equipment that is low voltage, double insulated or protected by a GFCI in these situations.
- Personal fall arresting systems must be used where present.

Trees

- A mechanical lift is the preferred method to access the upper portions of a tree.
- Where a mechanical lift can’t be used, climbing gear must be considered. Training is required for climbing gear.

Lifts, Powered Platforms

- A personal fall arrest system is typically necessary with a mechanical lift.

Recordkeeping

Records shall be kept for training as required in section 6.0 below and in accordance with Records Retention for Safety, Health and Environmental Protection procedure, AD-015, found in the Safety Manual.

Training and Information

Training is required for the following equipment and situations for individuals using:

- Personal fall arresting systems
- Installing and using scaffolding
- Positioning devices
- Boatswain chairs
- Powered Platforms as defined by 29 CFR 1910.66 and other mechanical lifts
- Nets

The employer shall provide a training program for each employee who may be exposed to fall hazards. The training program shall enable employees to recognize and eliminate falling hazards. Training shall be provided by a competent person and shall cover the following items:

- The nature of fall hazards in the workplace.
- The correct procedures for erecting, maintaining, inspecting, disassembling, use and operation of those fall protection systems covered under the FALL PROTECTION SYSTEMS section of this program.
- The limitations of use of mechanical equipment during the performance of roofing work on low-sloped roofs.
- The correct procedures for handling and storing equipment and material used.
- The regulatory standards covered by this program.

The department shall verify that training has been provided by written certification containing all of the following information:

- Name/identity of employees trained; and
- The date(s) training was provided; and
- The signature of the person providing the training.

The most current training certification records shall be maintained by the department. Re-training shall be provided under the following conditions:

- The employer has reason to believe retraining is needed; or
- Changes in the workplace render previous training obsolete; or
- Changes in the type(s) of fall protection used render previous training obsolete; or
- Inadequacies in the affected employees knowledge of fall protection systems or equipment indicate that the employee has not retained the necessary understanding or skill.

References

29 CFR 1910 Subpart D, "Walking-Working Surfaces"

29 CFR 1910 Subpart F, “Powered Platforms, Man lifts, and Vehicle-Mounted Work Platforms”

29 CFR 1910.132 “Personal Protective Equipment”

29 CFR 1926 Subpart M, “Fall Protection”

ANSI/ASSE Z359 Fall Protection

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