




Fall Protection

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I. PURPOSE

The purpose of this Fall Protection Program is to:

-  Prevent falls to lower levels or through holes and openings in walking/working surfaces;
-  Protect UND personnel from fall hazards; and,
-  Comply with University of North Dakota safety and health policy and applicable Occupational Safety and Health Administration standards.

II. POLICY

The University of North Dakota strives to provide a safe and healthy environment for its students, faculty, staff, and visitors. Engineering and administrative controls, safe work practices, and the use of personal protective equipment remain the primary means of controlling work related injuries. The information in this document represents the acceptable requirements regarding fall protection. Affected persons must be trained in these procedures and strictly adhere to them except when doing so would expose the person to a greater hazard. A person's failure to follow the policies and procedures outlined in this document could lead to disciplinary action, up to and including termination.

III. SCOPE

This program provides requirements for conventional fall protection systems. It also provides requirements necessary to safeguard against falls for work activities that make conventional fall protection systems infeasible or when the use of such systems would create a greater hazard.

A. The requirements of this program **DO NOT** apply to the following:

1. Slips, trips, and falls. For additional information refer to the on-line Safety and Loss Control manual at <http://www.safety.und.edu/policy/manual/grounds/grounds.html#walkways>.
2. When design for guards in new and remodeled areas meets the requirements called for by the applicable building code that is current at the time;
3. When making inspections, during investigation, or during assessment of workplace conditions prior to the start of construction work or after construction work has been completed unless the worker(s) or supervisor deems it necessary;
4. Factory installed surfaces that are an integral part of self-propelled, motorized mobile equipment other than aerial lifts and platforms hoisted or lifted by powered industrial trucks;
5. Fall hazards from the exposed perimeters of entertainment stages;
6. On raised stage and platform floor areas such as runways, ramps, and side stages used for entertainment or presentation;
7. In assembly seating where special guards are permitted and provided as called for in the building code;
8. Operations, equipment or facilities with fall protection provisions contained in other regulations or nationally recognized standards such as

- a. Steel erection.
- b. Scaffolding.
- c. Rigging.
- d. Working on cranes and derrick surfaces.
- e. Erection of tanks and communication and broadcast towers.
- f. Equipment used in tunneling operations.
- g. Exterior building maintenance platforms.
- h. Ladders.
- i. Powered exterior maintenance platforms
- j. Construction of electric transmission and distribution lines and equipment.

B. Requirements contained within this program apply to all UND personnel, contractors, vendors, and visitors while at UND or UND controlled sites. Contractors may use their own fall protection program provided it meets at least the requirements of this program. When working at non-UND controlled sites, UND personnel must either follow the site-controllers program or this program, whichever is more stringent.

IV. REFERENCES

Occupational Safety and Health Administration. Washington D.C.: U.S. Government Printing Office

- 29 CFR 1910.23, *Guarding Floor and Wall Opening and Holes*
- 29 CFR 1910.66, *Appendix C, Section I, Personal Fall Arrest System*
- 29 CFR 1926.500, *General Requirements*
- 29 CFR 1926.501, *Duty to Have Fall Protection*
- 29 CFR 1926.502, *Fall Protection Systems Criteria and Practices*
- 29 CFR 1926.503, *Fall Protection Training Requirements*

V. DEFINITIONS

- A. **Anchorage:** A secure point of attachment for lifelines, lanyards, or deceleration devices. Anchorage points must meet Occupational Safety and Health Administration (OSHA) strength requirements.
- B. **Body Belt:** A belt that may be attached to a lanyard(s) or lifeline for purposes of positioning or restraining.
- C. **Body Harness:** A harness that will distribute fall-arresting forces over at least the thighs, pelvis, waist, chest, and shoulders. Harnesses have a means for attaching a lanyard, lifeline, or deceleration device.
- D. **Bridging Devices:** A surface used to span the gap between a loading dock and a vehicle or between vehicles.
- E. **Buckle:** Means any device for holding the body belt or body harness closed around the person's body.
- F. **Carabiners:** Metal rings with spring-loaded gates, used as connectors. Carabiners must be capable of withstanding a load of 5000 pounds and must be double locking.

- G. **Competent Person:** Someone who is capable of identifying existing and predictable hazards which are unsanitary, hazardous, or dangerous to people, and who has authorization to take prompt corrective action to eliminate those hazards.
- H. **Controlled Access Zone:** An area in which work may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is restricted.
- I. **Dangerous Equipment:** Equipment which may be hazardous to people if fallen onto or into.
- J. **Deceleration Device (shock absorber):** Any mechanism, such as a rip-stitch lanyard, specially woven lanyard, tearing or deforming lanyards, etc., that serves to dissipate or limit the energy imposed on a person during a fall.
- K. **Deceleration Distance:** Additional distance a person will travel when the deceleration device begins to operate.
- L. **Designated Area:** A space which has a perimeter barrier erected to warn people when they approach an unprotected side or edge, and serves also to designate an area where work may be performed without additional fall protection.
- M. **D-Rings:** Attachment points on a body harness for deceleration devices or lanyards. D-rings must be capable of sustaining a minimum tensile strength of 5,000 pounds.
- N. **Free Fall Distance:** The vertical distance a person will travel during a fall before the fall is arrested. This distance excludes deceleration distance and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.
- O. **Guardrail System:** A barrier built to prevent people from falling to lower levels. Guardrail systems normally consist of a top rail, intermediate rail(s), posts, and toeboard.
- P. **Hardware:** Buckles, D-rings, snap hooks, and associated hardware which are used to attach components of a personal fall protection system together.
- Q. **Keepers:** Keepers are devices which remain closed until unlocked and pressed open for connection or disconnection. This feature of locking snaps significantly reduces the possibility of accidental disengagement or "rollout."
- R. **Hole:** An opening measuring more than 2 inches in its least dimension in any floor, roof, platform, or other walking/working surface where personnel stand or walk.
- S. **Infeasible:** It is impossible to perform the work using a conventional fall protection system (i.e. guardrail system, safety net system, and personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.
- T. **Lanyard:** A flexible line of rope, wire rope, or strap that has a connector at each end for connecting a body belt or body harness to a deceleration device, lifeline, or anchorage.
- U. **Leading Edge:** The edge of a floor, roof, framework for a floor, and similar surfaces that change location as work progresses.
- V. **Lifeline:** A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline) or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline) and that serves for connecting other components of a personal fall arrest system to the anchorage.
- W. **Mobile Mechanical Equipment:** Motor or human propelled wheeled equipment, other than wheelbarrows and mop carts, used for roofing work.
- X. **Opening, Wall:** A gap or void less than 39 inches above a walking/working surface that is 30 or more inches high and 18 or more inches wide in a wall or partition through which someone can fall to a lower level.

- Y. Personal Fall Arrest System:** A system used to stop someone during a fall. Personal fall arrest systems consist of an anchorage, connectors, a body harness, and lanyard with deceleration device, lifeline, or suitable combinations of these items.
- Z. Positioning Device:** A body belt or harness rigged to allow someone to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.
- AA. Qualified Person:** Someone, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated his/her ability to solve or resolve problems relating to the subject matter, work, or project.
- AB. Restraining Device:** A body belt or harness rigged in such a way that a person cannot get to the fall hazard.
- AC. Roof, Low-slope:** A roof having a slope less than or equal to 4:12 (vertical to horizontal).
- AD. Roof, Steep:** A roof having a slope greater than 4:12 (vertical to horizontal).
- AE. Safety-Monitoring System:** A procedure in which a person is responsible for recognizing and warning personnel of fall hazards.
- AF. Self-Retracting Lifeline/Lanyard:** A deceleration device containing a drum-wound line that can be slowly extracted from or retracted onto the drum under slight tension during normal movement. After the onset of a fall, the device automatically locks the drum and arrests the fall.
- AG. Snap hook:** A self-closing device with a keeper, latch, or similar arrangement, which will remain closed until manually opened.
- AH. Synthetic Rope:** Ropes and straps made of synthetic fiber that are used in lanyards, lifelines, and strength components of body belts and body harnesses.
- AI. Thimbles:** A metal or plastic ring around which the eye of a rope or webbing is passed to protect the rope or webbing from being easily damaged.
- AJ. Toeboard:** A low protective barrier that will prevent the fall of materials and equipment to lower levels.
- AK. Unprotected Sides and Edges:** Any side or edge of a walking/working surface (e.g., floors, roofs, ramps, or runway) that is at least 4 feet (*6 feet for construction activities*) above a lower surface or any distance above a dangerous piece of equipment and does not have a wall or guardrail system.
- AL. Warning Line:** A barrier built to warn people that they are approaching an unprotected roof side or edge, and which designates an area in which work may take place without the use of a guardrail, fall arrest system, or safety net system.
- AM. Webbing:** A strong, narrow, closely woven fabric used for belts, harnesses, and lanyards.

VI. INTRODUCTION

Although there are some differences in the regulatory requirements, this program covers fall protection requirements for non-construction and construction activities. Non-construction activities include equipment installation, service, maintenance, repair of buildings/equipment, painting, decorating, etc, when these activities do not occur in a construction zone. Construction generally refers to the process of building new buildings, the renovation of existing buildings, or roof replacement. Some tasks commonly considered non-construction must meet construction requirements if being conducted as a part of a construction project.

VII. PROCEDURE

A. Holes

1. Personnel must be protected from stepping into or falling through holes (including skylights) in walking/working surfaces 4 feet (*6 feet for construction activities*) or more above the lower level, or regardless of distance above dangerous equipment, by covers, guardrails, restraint systems, or personal fall arrest systems.
2. When equipment or piping penetrates the floor and space is necessary between the equipment and surrounding floor for expansion, contraction, vibration, or similar movement, the following apply:
 - a. Guards including toeboards, are not required when the largest gap between the penetrating equipment and the floor is less than 2 inches.
 - b. Toeboards only are required when the largest gap between the penetrating equipment and the floor is more than 2 and less than 6 inches.
3. Guardrails
 - a. When guardrail systems are used at holes, they must be erected on all unprotected sides or edges of the hole.
 - b. When guardrail systems are used around holes that are used as points of access (such as ladder ways), they must be provided with a gate, or be so offset that a person cannot walk directly into the hole. (See Appendix A)
 - c. When guardrail systems are used to protect from falls through holes that are used to pass materials, no more than two of the sides are allowed to be removed at any time. When the hole is not in use, it must be covered or the guardrail system must be installed along all unprotected sides or edges.
4. Covers
 - a. Permanent covers placed over walking/working surface openings must:
 - 1) Be kept as low in height as practical, not to exceed 1/4 inch in height if in a walk way and not to exceed 1 inch in height when not in a walk way;
 - 2) Have its edges chamfered to an angle of 30 degrees or less or use other means such that the cover does not pose a trip hazard;
 - 3) Be of sufficient strength to support 250 pounds or twice the expected weight of personnel and equipment, whichever is greater;
 - 4) Be secured to the walking/working surface; and
 - 5) Not substantially decrease the efficiency of the fire suppression system.

Note: Permanent floor opening covers installed prior to the effective date of this program are considered acceptable, provided they do not present a safety hazard.

b. Temporary covers placed over walking/working surface openings must be:

- 1) Color coded yellow or have "**COVER**" clearly marked on the exposed surface of the cover.
- 2) Of sufficient strength to support 250 pounds or twice the expected weight of personnel and equipment, whichever is greater.

Note: Covers located on roadways and vehicular aisles must be capable of supporting at least twice the maximum axle load of the largest vehicle expected to cross over the cover.

- 3) Secured to prevent accidental displacement.

B. Wall Openings

Wall openings in areas accessible to the general public must be protected in accordance with the applicable building code. Wall openings in non-public areas must be guarded when a fall could occur from 4 feet (*6 feet for construction activities*) to a lower level or, regardless of distance, onto dangerous equipment. When guardrails must be temporarily removed, personnel within 15 feet of the opening must be protected by use of a fall protection system.

C. Hoisting and Other Similar Areas

Requirements for hoist and similar areas

Each person within 15 feet of an open hoist or similar area must be protected from falling by a fall protection system (e.g. guardrail system, restraining device system, or personal fall arrest system). When guardrail systems are used at hoisting and similar areas, a chain, gate, or removable guardrail section must be placed across the access opening between guardrail sections when hoisting operations are not taking place, or guardrails must be so offset that a person cannot walk directly into the access opening (See Appendix A). Personnel who land hoisted materials must be protected from falls by use of a fall protection system whenever any part of a guardrail system is removed and whenever landing personnel must lean over the edge of the guardrail.

Exception: A fall protection system is not required for personnel when a lift is made to an elevated platform and all the following apply:

1. Those not directly involved with the operation are restricted from the area;
2. Materials are hoisted by means of a forklift or similar lifting equipment that will not allow the load to swing;
3. Personnel must be able to unload all materials without reaching over the edge of the walking/working surface;
4. The space between the guardrail or wall opening and lifting equipment is no more than 18 inches at its least distance; and
5. The guardrail or wall opening is closed immediately after materials are unloaded.

D. Roofs and Other Elevated Surfaces

1. Requirements for non-construction operations

a. New or replacement equipment:

- 1) Guards or personal fall protection anchorage points must be installed in conjunction with new or replacement equipment to protect those who service the equipment from falls whenever the following apply:
 - a) The equipment that will require service is located within 10 feet of a roof edge or open side of a walking/working surface; and
 - b) The walking/working surface is located more than 30 inches (or current building code height) above the grade below, or regardless of height, over hazardous equipment.
- 2) When personal fall protection anchorage points are used, there must be enough points with sufficient strength to handle the number of personal expected to work on the equipment for typical maintenance or repair activities.

b. Flat roofs and other elevated walking/working surfaces with less than 10 percent slope:

Personnel performing equipment installation, service, maintenance, repair, or similar activities on flat roofs and other elevated platforms with a slope of less than 10 percent from horizontal must be protected from falling 4 feet or more by use of:

- 1) Guardrails, safety nets, fall restraint systems, fall arrest systems; or
- 2) A “designated area” as described in section VII. Q.

Exception: A designated area is not required when the personnel performing installation, service, maintenance, repair, or similar activities can perform all work without coming closer than 15 feet from the elevated surface edge.

c. Work on roofs and other elevated surfaces greater than 10 percent slope:

Personnel performing equipment installation, service, maintenance, repair, and similar activities on roofs and other elevated surfaces with a slope greater than 1:10 pitch from horizontal and more than 4 feet above a lower level must be protected by guardrail systems with toeboards, safety net systems, or fall arrest systems.

2. Requirements for roof construction operations

a. Roofing work on low slope roofs

Personnel performing roofing operations on low slope roofs (having a slope of less than or equal to 4:12) must be protected from falling when the roof has unprotected sides or edges more than 6 feet above lower levels by use of:

- 1) Guardrails, safety nets, or fall arrest systems; or
- 2) A combination of roof warning line system and guardrail system, roof warning line system and safety net system, roof warning line system and personal fall arrest system, or roof warning line system and safety monitoring system.

Note: A safety monitoring system without a roof warning line is allowed when a low slope roof is less than 50 feet in width.

b. Roofing work on steep roofs

Personnel on steep roofs (greater than 4:12 pitch) that are 6 feet or more above lower levels must be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

c. Roof warning line systems

Conventional fall protection systems often interfere with the installation of roof waterproofing membranes and related materials. Because of this problem, warning lines are allowed to be used in lieu of conventional fall protection systems for those personnel involved with the roofing operation. Warning lines are not required for roofing operations occurring on roofs of less than 50 feet in width when a safety monitor is used. This 50-foot exception is because there would be little effective area in which to work after the erection of the warning lines. Following are the requirements necessary when roof warning line systems are used:

- 1) Roof warning lines must be erected at least 6 feet from all unprotected sides/edges of the roof work area. The following apply to roof warning lines:
 - a) When mobile mechanical equipment is being used, the roof warning line must be erected at least 6 feet from the roof edge that is parallel to the direction of operation, and at least 10 feet from the roof edge that is perpendicular to the direction of the mobile mechanical equipment operation to increase stopping distance; and
 - b) Points of access, materials-handling areas, storage areas, and hoisting areas must be connected to the work area by an access path formed by two warning lines. When the path is not in use, a rope, wire, chain, or other barricade (of equivalent strength and height to the warning line) must be placed across the path.
- 2) Roof warning lines must:

- a) Consist of rope, wire rope, chain, or other suitable material and supporting stanchions. The tensile strength of the rope, wire rope, or chain used must be at least 500 pounds;
 - b) Be flagged or otherwise clearly marked at least every 6 feet with high-visibility material, such as flags or caution tape;
 - c) Be rigged and supported in such a way that its lowest point (including sag) is not less than 34 inches and its highest point is not more than 39 inches above the walking/working surface;
 - d) Be attached to the stanchions in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in the adjacent sections before the stanchion tips over. Stanchions must also be capable of withstanding a minimum force of 16 pounds applied horizontally to the stanchion 30 inches above the walking/working surface without tipping over;
 - e) Have each end substantially connected.
- 3) Only those personnel performing roofing work are allowed between the warning line and roof edge.
 - 4) Mobile mechanical equipment used on roofs must be used and stored only in areas where personnel are protected by a warning line system, guardrail system, or fall arrest system.

E. Unprotected Sides or Edges

1. Requirements for unprotected sides or edges

- a. People not performing equipment installations, service, maintenance, repair, or operational activities or not trained in fall hazard recognition and prevention must be restricted from areas not protected by guardrails.
- b. Guardrails in public areas must meet the requirements of the building code at the time of construction.
- c. Fall protection requirements apply in areas that are not accessible to the public when a fall of 4 feet or more (*6 feet for construction activities*) can occur or regardless of distance whenever a fall could occur onto dangerous equipment.

2. Leading edges

Personnel constructing or having exposure to a leading edge 6 feet or more above a lower level must be protected from falls by guardrail systems, safety nets, or personal fall arrest systems.

Exception: If it is infeasible or creates a greater hazard to use one of the three conventional fall protection systems listed when performing leading edge work, a fall protection plan meeting, at least the requirements of section VII.R, must be established to ensure adequate protection of personnel.

F. Ramps and Bridging Devices

1. General requirements

- a. Ramps and bridging devices must be constructed to support their maximum intended loads to be determined by a qualified person.
- b. Ramps and bridging devices used for vehicle passage must be constructed and maintained to prevent vehicles from running off the edge.
- c. Unless pedestrians can precede or follow a vehicle at a safe distance, a separate and distinct walk way for foot passage is required on ramps and bridging devices whenever passage of pedestrians and motorized vehicles must occur simultaneously.
- d. Ramps and bridging devices must be secured to prevent their displacement while personnel are on them.
- e. Vehicles, such as trucks and rail cars, onto which a ramp or bridging device is placed must be prevented from moving by chocks or similar means while personnel are using the ramp or bridging device.
- f. Portable ramps or bridging devices must contain handholds, grab handles, or other means for safe handling.
- g. Ramps or bridging devices constructed of two or more planks must have the planks securely connected together to prevent displacement.
- h. Guardrail systems used on ramps and runways must be erected along each unprotected side or edge.

2. Fixed ramps

- a. Fixed ramps used by people and having an angle greater than 20 degrees from the horizontal must be provided with guardrails meeting the requirements of section VII. K.
- b. People are not allowed to use ramps for walking/working surfaces when their angle is greater than 30 degrees from horizontal.
- c. Ramps which have a fall hazard of 4 feet or more must be provided with a guardrail system or equivalent fall protection system.

3. Portable elevating ramps and bridging devices

- a. When one or both ends of a portable or elevating ramp or bridging device are not secured to the vehicle or dock, there must be an overlap of at least 4 inches onto the unattached surface(s).
- b. A fall protection system is required to protect personnel from falls from portable ramps and bridging devices 4 feet (*6 feet for construction activities*) above a lower level or, regardless of distance above dangerous equipment.
- c. Fall protection systems are not required for ramps or bridging devices when they are being used exclusively for material handling operations with motorized equipment, when:
 - 1) Personnel engaged in these operations are exposed to falls of less than 10 feet; and
 - 2) Those personnel have been trained to recognize and avoid the hazards involved with this work. This training must consist of instructions in the proper placement

and securing of the ramps and bridging devices, securing of vehicles, and the proper use of material-handling equipment.

G. Powered Industrial Truck Platforms

The following requirements apply to powered industrial truck (forklift) platforms:

1. Platforms must be secured to the lifting carriage or forks of the industrial truck.
2. Personnel on a platform must be protected from the truck's moving parts and pinch points, such as the area between the guardrails of the platforms and carriage.
3. Platform width must be at least 18 inches.
4. Platforms must not exceed lift truck capacities established by the manufacturer.
5. Personnel on platforms of powered industrial trucks **without** extending or articulating booms must be protected by a guardrail system or a personal fall arrest system whenever working from heights of 4 feet (*6 feet for construction activities*) or more, or regardless of height if positioning occurs over dangerous equipment.
6. Personnel on platforms of powered industrial trucks **with** extending or articulating booms must be protected from falls of 4 feet (*6 feet for construction activities*) or more, regardless of the height if positioning occurs over dangerous equipment as follows:
 - a. When platforms contain guardrails, a personal fall restraint or fall arrest system must also be used.
 - b. If a platform must be used without a guardrail, a personal fall arrest system must be used.

H. Aerial Lifts

When working from aerial lifts, people must be protected from falls by using a fall restraint system or a personal fall arrest system. Aerial lifts include such vehicle-mounted lifts as extendable boom platforms, aerial ladders, articulating boom platforms, and vertical towers.

1. Tying off to an adjacent pole or structure is not allowed.
2. Do not sit or climb on the edge of the basket or use planks or other devices for work position.

Note: The use of a crane to hoist someone in a personnel platform (basket) is prohibited unless the erection, use, and dismantling of conventional methods for reaching the work site (such as personnel hoist, ladder, stairway, elevating work platform, or scaffolding) would be more hazardous or is not possible because of structural design or work site conditions. Safety and Environmental Health or their designee approval is required when such lifts are necessary.

I. Excavations

Excavations that are 6 feet or more in depth and not readily visible because of plant growth or other visual barriers must be protected by guardrail systems, fences, or barricades. Personnel at

the edge of trenches, wells, pits, shafts, and similar excavations must be protected from falling 6 feet or more by guardrail systems, fences, barricades, covers, or personal fall protection systems. See UND Standard Practice 310, Excavation and Trenching, for additional requirements during excavation and trenching activities.

J. Protection from Falling Objects

Requirements for protection from falling objects

Personnel in areas exposed to falling object hazards must wear hard hats and one of the following protection measures must be implemented.

1. Provide toeboards, screens, or guardrail systems to prevent objects from falling;

Note: When toeboards or screens are used, they must run a distance along the edge of the walking/working surface that is sufficient to protect personnel below. Toeboards must be constructed in accordance with section VII. K. 2. d.

2. Provide a canopy structure strong enough to prevent penetration by any object that might fall onto the canopy and place potential fall objects away from the edge of the higher level;
3. Barricade the area where objects could fall, prohibiting people from entering the barricaded area, and placing potential fall objects away from the edge of the higher level;
4. Assign a person to keep others from entering the falling object hazard area.

K. Guardrail Design/Installation

1. Guards/Guardrails are not required for the following locations:

- a. On the loading side of loading docks, where the dock is only accessible by door.
- b. On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.
- c. On raised stage and platform floor areas such as runways, ramps, and side stages used for entertainment or presentations.
- d. At vertical openings in the performance area of stages and platforms.
- e. At elevated walking surfaces added to stages and platforms for access to and utilization of special lighting or equipment.
- f. In assembly seating, where guards are permitted and provided as called for in the building code.

2. Fall protection systems criteria and practices for guardrails

Guards/guardrail systems must be the primary means of protecting personnel from falls to lower levels or onto dangerous equipment. When such systems are not practical, the work/area supervisor must ensure that appropriate alternative fall protection, such as hole covers, personal restraint systems, personal fall arrest systems, safety nets, or designated area

systems, are used. Guardrail systems and their use must comply with the following provisions:

a. General

- 1) Permanent guardrail systems must meet the requirements of the building code in use at the time.
- 2) Top and midrails of temporary guardrail systems must be at least 1/4-inch nominal diameter or thickness. If the material used for the top rail cannot be readily seen, it must be flagged with high-visibility material at least every 6 feet. If wire rope is used as a top rail on a construction project, it must be flagged every 6 feet.
- 3) Guardrails must have surfaces that will not create an injury due to punctures or lacerations and they cannot snag clothing.
- 4) Steel and plastic banding cannot be used as top rails or midrails.
- 5) Manila, plastic, or synthetic rope, if used for top rails or midrails, must be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of this section.
- 6) The ends of top and midrails cannot overhang the terminal posts, if the overhang will constitute a projection hazard.

b. Top rails

- 1) The top rail or member of a guardrail system must be capable of withstanding a force of at least 200 pounds applied within 2 inches of the top edge of the rail in any downward or outward direction at any point along the top edge and:
 - a. For guardrail systems installed **before** this program was established, when the 200 pound test load is applied in the downward direction, the top edge of the guardrail must remain at least 36 inches above the guarded surface level.
 - b. For guardrail systems installed **after** this program was established, when the 200 pound test load is applied in the downward direction, the top edge of the guardrail must remain at least 39 inches above the guarded surface level.
- 2) The top member of guardrail systems installed before this program was established must be at least 36 inches above the guarded surface under all conditions.
- 3) The top member of guardrail systems installed after this program was established must be at least 42 inches above the walking/working surface. When conditions warrant (such as the use of stilts), the height of the top edge may exceed the 42-inch height, provided the guardrail system meets all other design and construction criteria.

Note: In a non-construction setting, the height of the top rail of a guardrail need not be adjusted if the walking/working surface is built up (by adding carpet, etc.) after the installation of a guardrail system, provided the height from the guarded surface and the top rail never becomes less than 36 inches when a 200 pound force is applied in a downward direction.

Exception: In a non-construction setting, as an alternative to complying with the preceding, the height of the top surface of a guard system may be reduced to as low as 30 inches from the guarded surface, provided the sum of the depth (horizontal distance) of the top edge and the height of the top edge (vertical distance from the work surface to the top edge of the top member) is at least 48 inches (e.g. 30 inches high & 18 inches deep equal 48 inches or 32 inches high & 16 inches deep equal 48 inches).

c. Midrails

- 1) Midrails, screens, mesh, intermediate vertical members, solid panels, or equivalent structural members must be provided between the toprail of the guardrail system and the walking/working surface. A midrail is not required when there is a parapet wall at least 21 inches high.
- 2) Midrails and equivalent structural members must be capable of withstanding a force of at least 150 pounds applied in any downward or outward direction at any point along the midrails or other structural member. No permanent deformation in the system is allowed when the force is removed.
- 3) Screens and mesh when used as midrail replacement, must extend from the top rail to the walking/working level.
- 4) Midrails or other intermediate members must be positioned so the openings in the guardrail system are no more than 19 inches in their least dimension.

d. Toeboards

When toeboards are used, they must run a distance along the edge of the walking/working surface that is sufficient to protect personnel below. Toeboards must:

- 1) Be constructed of material at least a minimum of 3 ½ inches in vertical height with no more than a ¼-inch gap between the walking/working surface and the bottom of the toeboard; and
- 2) Withstand a force of at least 50 pounds applied in any downward or outward direction at any point along the toeboard.

Note: Toeboards are usually solid but may have openings of 1 inch or less. When tools, equipment, and/or materials are piled higher than the toeboard, paneling, or screening, must be installed from the walking/working surface or toeboard to a height sufficient to protect personnel below.

L. Stairs and Associated Rails

Permanent stair and associated guard and handrail installations must be designed and installed to meet requirements of the building code in use at the time. The following requirements apply to all stairways as indicated:

1. Industrial stairs in non-construction settings must be designed and protected in accordance with 29 CFR 1910.24.
2. Stairways utilized during construction must be designed, protected, and used in accordance with 29 CFR 1926.1052.

M. Personal Fall Protection

Requirements for personal fall protection

Personal fall protection systems consist of fall restraint systems, positioning device systems, and fall arrest systems. These systems are often the first option chosen to prevent falls when guardrail systems and hole covers are not feasible. Personal fall protection equipment design must meet specific strength and other design requirements as called for in 29 CFR 1926.502. All personal fall protection equipment stating that it meets OSHA requirements or that it meets the requirements of applicable ANSI standards is acceptable. Consideration should be given to the particular work environment when choosing system components. For example, the presence of corrosive materials, dirt, moisture, oil, grease, etc., and their effect upon the fall equipment chosen should be evaluated. Hot or cold environments may also have an adverse effect on a fall protection system. Some specific requirements regarding personal fall protection systems are:

1. General

- a. Only use personal fall protection components for their intended purpose.
- b. Store personal fall protection hardware in areas that will protect the equipment from damage.
- c. Inspect each item of the fall protection system before use. Always follow the manufacturer's recommendations for inspections. Sample inspection checklists are included in Appendix B through E of this program.
- d. Protect lifelines from being cut or abraded.
- e. Snap hooks used in personal fall arrest systems must be of the locking type.
- f. Periodically clean equipment according to the manufacturer's recommendations.
- g. Avoid dirt and other types of build-up on the equipment.
- h. Never store fall protection equipment in an area exposed to solvents or corrosive materials.

2. Personal fall arrest systems

- a. Body belts are not allowed in a personal fall arrest system. Body harnesses must be used for this purpose.
- b. Deceleration devices should be used in fall arrest systems. They must be used whenever the arresting force to a person could exceed 1,800 pounds.
- c. Personal fall arrest systems must not be attached to guardrails or hoists unless specifically designed for attachment.
- d. At least one other person who can summon rescue operations must be available whenever a personal fall arrest system is used.

- e. Personal fall arrest systems must be rigged so the maximum free fall distance is less than 6 feet and so the person does not contact a lower level. One must account for 3.5 feet (see manufacturers information) for the deceleration device, in addition to the free fall distance, when making sure contact to a lower level is not made.
- f. Unless designed as a complete personal fall arrest system with a safety factor of 2 by a qualified person, anchorage points must be capable of supporting at least 5,000 pounds/person attached.
- g. Locate anchorage points directly above the person when possible. This limits free fall distance and reduces swing should a fall occur.
- h. The lanyard/deceleration device must be attached to the D-ring that is located in the upper back of the harness.
- i. Lanyards and vertical lifelines require a minimum breaking strength of 5,000 pounds.
- j. Self-retracting lanyards that limit free fall distance to 2 feet or less may be designed to handle a minimum tensile strength of 3,000 pounds with the lifeline or lanyard in the fully extended position. Self-retracting lanyards not meeting the 2 feet limitation must be rated for at least 5,000 pounds.
- k. Each person must be attached to a separate lifeline when vertical lifelines are used.

Exception: During elevator shaft construction, 2 workers are allowed to attach to one lifeline of at least 10,000 pounds strength.

- l. Horizontal lifelines must be designed, installed, and used under the supervision of a qualified person.
- m. Immediately remove fall arrest components that have been impact loaded from service until inspected by a qualified person. Some components will require replacement after having received the force from a fall.

3. Requirements for positioning device systems

Positioning devices must consist of a body belt or harness equipped with side D-rings, lanyards, or connectors with double locking snap hooks and be rigged to limit free fall to less than 2 feet. Positioning devices must:

- a. Be secured to an anchorage capable of supporting at least twice the impact load of a person's fall or 3,000 pounds, whichever is greater.
- b. Be inspected before each use for wear, damage, and other deterioration. All defective equipment must be removed from service.

4. Requirements for restraining device systems

The purpose of a restraining device is to keep people from falling by physically restraining movement. Restraint systems must stop people before their feet reach the edge of the opening. The person using a restraining device must use a body belt or harness, lanyard, and tie off point. The fall restraint must have at least the following capacity:

- a. To withstand at least 3,000 pounds of force; or

- b. When designated by a qualified person, twice the maximum expected force that is needed to restrain the person from the fall hazard.

N. Safety Nets

Safety net systems

Safety net systems may be a viable option for some projects. When used, safety net systems must be designed, installed, tested, and used according to the requirements contained in 29 CFR 1926.50(c).

O. Controlled Access Zones (Construction Operations Only)

Controlled access zones are used as a way to limit the number of workers that would be exposed to the hazard of falling from unprotected sides or edges of those locations where the use of conventional fall protection systems is infeasible or creates a greater hazard. The only work situation where the use of controlled access zones are permitted instead of conventional fall protection systems is in overhand bricklaying operations when personnel do not need to reach more than 10 inches below the walking/working level to do their work. However, when accompanied by a fall protection plan meeting the requirements of section VII. R., controlled access zones are allowed for activities where conventional fall protection systems are infeasible or would create a greater hazard during residential construction, precast concrete erection, and leading edge work.

In general, a controlled access zone is formed by erecting a “control line(s)” or other means to restrict access to an area or to define the area in which personnel will work without conventional fall protection. Criteria for controlled access zones are as follows.

Note: See 29 CFR 1926.502(g) for controlled access zone requirements when used in overhand bricklaying operations.

1. Control lines cannot be closer than 6 feet or more than 25 feet from the unprotected edge except for precast concrete erection which allows a maximum distance of 60 feet or one half the length of the member being erected, whichever is less.
2. The control line must extend along the entire length of and be approximately parallel to the unprotected or leading edge.
3. The control line must be connected on each side to a guardrail system or wall.
4. Control lines must consist of ropes, wires, tapes, or equivalent, and supporting stanchions as follows:
 - a. Control lines must be flagged or clearly marked at least every 6 feet with high visibility material.
 - b. Control lines must have a minimum breaking strength of 200 pounds.
 - c. A control line must be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches and its highest point is no more than 45 inches off the walking/working surface.

P. Safety Monitoring Systems (Construction Operations Only)

Safety Monitoring Systems may be used to minimize fall hazards for personnel engaged in low slope roofing operations. A safety monitoring system may be used alone on roofs of less than 50 feet in width. A safety monitoring system must be used in conjunction with a roof warning line system or other conventional fall protection systems when a roof is more than 50 feet wide.

A safety monitoring system may also be used to minimize falls for personnel engaged in leading edge work, precast concrete erection, and residential construction, but only when it can be shown that the use of conventional fall protection systems are infeasible or would present a greater hazard. A fall protection plan containing all the elements listed in section VII.R of this program must be written and the information must be provided to workers before any work begins.

1. The designated safety monitor must:
 - a. Be competent to recognize fall hazards;
 - b. Warn personnel when it appears that they are unaware of a fall hazard or acting in an unsafe manner;
 - c. Be on the same walking/working surface and within visual sighting distance of personnel being monitored;
 - d. Be close enough to communicate orally with personnel they are monitoring at all times;
 - e. Not have any other responsibilities, which could take attention away from their monitoring function.
2. Mechanical equipment cannot be used or stored in areas where safety-monitoring systems are being used to monitor personnel engaged in roofing operations on low-slope roofs.
3. None, other than those engaged in roofing work (on low-slope roofs) or personnel covered by a fall protection plan, are allowed in areas utilizing a safety monitoring system.
4. Personnel working in a controlled access zone must be directed to comply promptly with fall hazard warnings from safety monitors.

Q. Designated Areas (Non-Construction Operations Only)

1. General requirements for use

A designated area is a section of a walking/working surface around which a perimeter line is erected so personnel within the area are warned when they see or contact the line that they are approaching a fall hazard. Designated areas may be established in lieu of guardrail systems when personnel within the designated area are not exposed to fall hazards and provided the following conditions and requirements can be met:

- a. The work must be temporary in nature, such as maintenance of roof top equipment.
- b. Designated areas are only allowed when the walking/working surface has a slope of no more than 10 degrees from horizontal.

- c. The designated area must consist of an area surrounded by material such as a rope, wire, or chain and supporting stanchions erected according to the criteria presented in the following section VII.Q.2.

2. Strength criteria

- a. After being erected with the line (such as rope, wire, or chain) attached, stanchions must be capable of resisting without tipping over, a force of at least 16 pounds applied horizontally against the stanchion. The force must be applied 30 inches above the work surface and perpendicular to the designated area perimeter, and in the direction of the unprotected side or edge.
- b. Designated area lines must have a minimum breaking or tensile strength of 500 pounds and after the line has been attached to the stanchions, it must be capable of supporting, without breaking, the loads applied to the stanchions presented in subsection 2.a above.
- c. The line must 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.

3. Height criteria

Designated area lines must be installed in such a manner that their lowest point (including sag) is not less than 34 inches or more than 39 inches from the work surface.

4. Visibility criteria

The line forming the designated area must be clearly visible from any unobstructed location within the designated area up to 25 feet away, or at the maximum distance a worker may be positioned away from the line, whichever is less.

5. Location criteria

- a. The perimeter of the designated area must be kept as close to the work area as practical and cannot be any closer than 6 feet from the unprotected side or edge. When mobile mechanical equipment is being used, the line must be placed no less than 6 feet from the unprotected side or edge that is parallel to the direction of mechanical equipment operation, and to provide greater stopping distance, no less than 10 feet from the unprotected side or edge that is perpendicular to the direction of the mechanical equipment operation.
- b. A clear path formed by two lines attached to stanchions and meeting the strength, height, and visibility requirements of this section, must designate access to the area.

R. Fall Protection Plan

The Fall Protection Plan option is available only to personnel engaged in leading edge work, precast concrete erection work, or residential construction work who can demonstrate that it is

infeasible or it creates a greater hazard to use conventional fall protection systems. A competent person must approve all fall protection plans. Sample fall protection plans can be found in Appendix E of 29 CFR 1926, Subpart M. Copies of the fall protection plans must be provided to Safety and Environmental Health or their designee prior to beginning work. Fall protection plans must conform to the following:

1. The fall protection plan must be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction work is being performed and the plan must be maintained and up to date.
2. A qualified person must approve any changes to the fall protection plan. The exception to this is that the supervisor can change the list of individuals that can work in controlled access zones once the supervisor assures that each individual added has had appropriate training.
3. A copy of the fall protection plan, with all approved changes, must be maintained at the job site.
4. The implementation of the fall protection plan must be under the supervision of a competent person.
5. The fall protection plan must document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) is infeasible or why their use would create a greater hazard.
6. The fall protection plan must include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the plan must discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby, reduce the hazard of falling.
7. The fall protection plan must identify each location where conventional fall protection methods cannot be used. These locations must then be classified as controlled access zones. The requirements for controlled access zones, contained in section VII.O of this program, must then be followed for these locations.
8. Where no other alternative measure has been implemented, a safety monitoring system as described in section VII.P of this program must be used.
9. The fall protection plan must include a statement which provides the name or other method of identification for each person who is designated to work in controlled access zones. No other persons may enter controlled access zones.
10. In the event a person falls or some other related serious incident occurs (e.g., a near miss), the supervisor, in conjunction with Safety and Environmental Health or their designee, must investigate the circumstances of the incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training). The supervisor must then implement those changes to prevent similar types of falls or incidents.

S. Emergency/Rescue Procedures

Do not attempt to rescue a person suspended from a fall arrest system unless specifically trained to do so. If emergencies arise during work activities, summon emergency services by calling 911 on the telephone or by having someone call for the services. Safety and Environmental Health

must also be contacted regarding any emergencies at 701-777-3341. When work takes place at off site locations, rescue procedures must be established before the work occurs.

T. Training

Training is required for personnel who perform duties that subject to fall hazards.

1. Fall protection training must consist of at least the following:

- a. Recognition of fall hazards and how to minimize the hazards;
- b. Equipment application limits;
- c. Proper hook-up, anchoring, and tie-off techniques;
- d. Estimation of free fall distance, including determination of deceleration distance and total fall distance, to prevent striking a lower level;
- e. Inspection and storage of equipment;
- f. 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;
- g. The role of each person in the safety monitoring system when this system is used;
- h. The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- i. The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection; and
- j. The role of personnel in fall protection plans.

2. Certification of training

Training must be documented through a written record/certification. The certification must include at least the printed name and signature of the person trained, the date(s) of the training, and the signature of the person who conducted the training. Each department is responsible for maintaining fall protection training documentation and for providing copies of such documentation to Safety and Environmental Health.

3. Retraining

Retraining is required whenever:

- a. There is reason to believe that any affected person who has already been trained does not have the understanding and skill required by paragraph T.1 of this section;
- b. Changes in the work environment or types of fall protection equipment to be used render previous training obsolete; or
- c. Inadequacies in a person's knowledge or use of fall protection systems or equipment indicate that the person has not retained the necessary understanding or skill.

U. Responsibilities

1. Safety and Environmental Health is responsible for:

- a. Ensuring that the requirements of this program remain current with the applicable regulatory standards.
- b. Ensuring that requirements of this program are being followed by conducting inspections, reviews, spot-checks, and other warranted follow-up action.
- c. Coordinating periodic training for those who use fall protection equipment.

2. Supervisors are responsible for:

- a. Ensuring all personnel authorized to use fall protection equipment are trained.
- b. Ensuring that personnel follow the requirements of this program.
- c. Establishing a written fall protection plan when conventional fall protection systems are not used.
- d. Investigation and documentation of all incidents and near misses regardless of severity.
- e. Ensuring that all personal fall protection equipment is inspected and maintained in accordance with manufacturer requirements.

3. All personnel are required to:

- a. Use fall protection equipment when required.
- b. Perform pre-use inspections of personal fall protection equipment.

Note: Refer to equipment inspection checklist in Appendix B to E and the equipment manufacturer guidelines.

- c. Report fall protection equipment deficiencies immediately to their supervisor.
- d. Report all incidents and near misses regardless of severity.

4. Students & visitors must:

- a. Get guidance from Safety and Environmental Health or their designee when using fall protection.
- b. Use the fall protection program as a guide to using fall protection.
- c. Report any incidents, injuries, and accidents to Safety and Environmental Health at 777-3341.

Appendix A Guardrail Offset

To view the graphic, please go to this website:

http://www.safety.und.edu/policy/programs/fall_protection/Fall%20Protection%20Program.pdf

Fixed Ladder

Guard rails

Wall

a. Offset guardrail protecting ladder access opening

Access Opening

b. Offset guardrail protecting a hoist area

Lift Hoist area

Guard rails

Floor

Floor

Appendix B

Full Body Harness Inspection Checklist

Harness Model/Name: _____

ID/Serial Number: _____

Comments: _____

General Factors	Accepted/Rejected	Supportive Details/Comments
1) Hardware: includes D-rings, buckles, keepers and back pads. Inspect for damage, distortion, sharp edges, burrs, cracks, and corrosion.	Accepted Rejected	
2) Webbing: Inspect for cuts, burns, tears, abrasions, frays, excessive soiling, and discoloration.	Accepted Rejected	
3) Stitching: Inspect for pulled or cut stitches.	Accepted Rejected	
4) Labels: Inspect, making certain all labels are securely held in place and are legible.	Accepted Rejected	
5) Other:	Accepted Rejected	
6) Other:	Accepted Rejected	
7) Overall Disposition:	Accepted Rejected	Inspected By: Date Inspected:

Appendix C

Lanyards Inspection Checklist

Lanyard Model/Name: _____

ID/Serial Number: _____

Comments: _____

General Factors	Accepted/Rejected	Supportive Details/Comments
1) Hardware: (includes snap hooks, carabiners, adjusters, keepers, thimbles, and D-rings) Inspect for damage, distortion, sharp edges, burrs, cracks, corrosion, and proper operation.	Accepted Rejected	
2) Webbing: Inspect for cuts, burns, tears, abrasions, frays, excessive soiling, and discoloration.	Accepted Rejected	
3) Stitching: Inspect for pulled or cut stitches.	Accepted Rejected	
4) Synthetic Rope: Inspect for pulled or cut yarns, burns, abrasions, knots, excessive soiling, and discoloration.	Accepted Rejected	
5) Energy Absorbing Component: Inspect for elongation, tears, and excessive soiling.	Accepted Rejected	
6) Labels: Inspect, making certain all labels are securely held in place and are legible.	Accepted Rejected	
7) Overall Disposition:	Accepted Rejected	Inspected By: Date Inspected:

Appendix D

Snap hooks/Carabiners Inspection Checklist

Hook/Carabiner Model/Name: _____

ID/Serial Number: _____

Comments: _____

General Factors	Accepted/Rejected	Supportive Details/Comments
1) Physical Damage: Inspect for cracks, sharp edges, burrs, deformities, and locking operations.	Accepted Rejected	
2) Excessive Corrosion: Inspect for corrosion, which affects the operation and/or the strength.	Accepted Rejected	
3) Markings: Inspect and make certain marking(s) are legible.	Accepted Rejected	
4) Other:	Accepted Rejected	
5) Other:	Accepted Rejected	
6) Other:	Accepted Rejected	
7) Overall Disposition:	Accepted Rejected	Inspected By: Date Inspected:

Appendix E

Self-Retracting Lanyard/Lifeline Inspection Checklist

Self-Retracting Lanyard/Lifeline Model/Name: _____

ID/Serial Number: _____

Comments: _____

General Factors	Accepted/Rejected	Supportive Details/Comments
1) Impact Indicator: Inspect indicator for activation (rupture of red stitching, elongated indicator, etc.).	Accepted Rejected	
2) Screws/Fasteners: Inspect for damage and make certain all screws and fasteners are tight.	Accepted Rejected	
3) Housing: Inspect for distortion, cracks, and other damage. Inspect anchoring loop for distortion or damage.	Accepted Rejected	
4) Lanyard/Lifeline: Inspect for cuts, burns, tears, abrasion, frays, excessive soiling, and discoloration.	Accepted Rejected	
5) Locking Action: Inspect for proper lock-up of brake mechanism.	Accepted Rejected	
6) Retraction/Extension: Inspect spring tension by pulling lanyard out fully and allowing to retract fully (lifeline must be taut with no slack).	Accepted Rejected	
7) Hooks/Carabiners: Inspect for physical damage, corrosion, proper orientation, and markings.	Accepted Rejected	
8) Labels: Inspect, making certain all labels are securely held in place and are legible.	Accepted Rejected	
9) Overall Disposition:	Accepted Rejected	Inspected By: Date Inspected: