

North Dakota State University

Fall Protection Program

I. Introduction

This NDSU program provides guidelines for the Fall Protection Program. 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.

II. Purpose

To identify and evaluate fall hazards to which employees will be exposed, and to provide specific training as required by the Safety and Risk Management Program.

III. Goals

The goal is to protect North Dakota State University employees from occupational injuries by implementing and enforcing safe work practices and appointing a responsible/competent person(s) to manage the Fall Protection Program.

IV. Assignment of Responsibility

A. Employer

North Dakota State University is committed to providing a Fall Protection Program to affected employees that will allow them to understand and adhere to the procedures of this plan.

B. Program Manager/Supervisor

It is the responsibility of the *Project Manager/Supervisor* to implement this program by Assigning and training a *Responsible Person* to oversee specific projects.

C. Responsible Person

1. Has the authority to implement this Fall Protection Program
2. Performs routine safety checks of work operations
3. Enforces North Dakota State University policy and procedures
4. Corrects any unsafe practices or conditions immediately
5. Trains employees and supervisors in recognizing fall hazards and the use of all protection systems before work begins on the project
6. Maintains records of employee training, equipment issue, and fall protection systems used at North Dakota State University job sites
7. Investigates and documents all incidents that result in employee injury
8. Maintains and inspects all personal fall protection equipment in accordance with the manufacturer requirements.

D. Employees

It is the responsibility of all employees to:

1. Understand and adhere to the procedures outlines in the Fall Protection Program

2. Perform pre-use inspections of the personal fall protection equipment;
3. Follow the instructions of the Project Manager/Supervisor
4. Bring to management's attention any unsafe or hazardous conditions or practices that may cause injury to either themselves or any other employees
5. Report to the UP&SO any incident that causes injury to an employee within 24 hours, regardless of the nature of the injury

V. Training

- A. All employees who may be exposed to fall hazards are required to receive training on how to recognize such hazards and how to minimize their exposure to them. Employees shall receive training as soon after employment as possible, and before they are required to work in areas where fall hazards exist.
- B. A record of employees who have received training and training dates shall be maintained by the department and/or the Project Manager/Supervisor. Training shall include:
 1. Nature of the fall hazards employees may be exposed to
 2. Correct procedures for erecting, maintaining, disassembling, and inspecting fall protection systems
 3. Use and operation of controlled access zones, guardrails, personal fall arrest systems, safety nets, warning lines, and safety monitoring systems
 4. Role of each employee in the Safety Monitoring System (if one is used)
 5. Limitations of the use of mechanical equipment during roofing work on low-slope roofs (if applicable)
 6. Correct procedures for equipment and material handling and storage, and erection of overhead protection
 7. Role of each employee in alternative Fall Protection Plans (if used)
 8. North Dakota State University requirements for reporting incidents to the UP&SO
 9. All North Dakota State University required training
- C. Additional training shall be provided on an annual basis, or as needed when changes are made to the Fall Protection Program, or any alternative Fall Protection Plan.

VI. Controlled Access Zones

Controlled access zone is an area in which certain work may take place without guardrail systems, personal fall arrest systems, or safety net systems. However, access to this zone is controlled.

- A. Masons are the only authorized employees permitted to enter controlled access zones and areas from which guardrails have been removed. All other workers are prohibited from entering controlled access zones.
- B. Controlled access zones shall be defined by control lines consisting of ropes, wires, tapes, or equivalent material, with supporting stanchions, and shall be:

1. Flagged with a high-visibility material at six (6) foot intervals
2. Rigged and supported so that the line is no lower than thirty four (34) inches and between thirty-nine (39) and forty-five (45) inches (including sag) high from the walking/working surface.
3. Strong enough to sustain stress of at least two hundred (200) pounds
4. Extended along the entire length of an unprotected or leading edge
5. Parallel to the unprotected or leading edge
6. Connected on each side to a guardrail system or wall
7. Erected between six (6) feet and twenty-five (25) feet from an unprotected edge, except in the following cases:
 - a. When working with precast concrete members between six (6) and sixty (60) feet from the leading edge, or half the length of the member being erected, whichever is less
 - b. When performing overhand bricking or related work between ten (10) feet and fifteen (15) feet from the working edge

VII. Excavations

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

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

VIII. Fall Protection Systems

A. Covers

1. All covers shall be secured to prevent accidental displacement
2. Covers shall be color-coded or bear the markings "HOLE" or "COVER"
3. Covers located in roadways shall be able to support twice the axle load of the largest vehicle that might cross them
4. Covers shall be able to support twice the weight of employees, equipment, and materials that might cross them

B. Guardrail Systems

Guardrail systems shall be erected at unprotected edges, ramps, runways, or holes where it is determined by the Project Manager/Supervisor or Responsible Person that erecting such systems will not cause an increased hazard to employees. The following specifications will be followed in the erection of guardrail systems:

1. Top-rails shall be
 - a. Capable of withstanding a force of at least two hundred (200) pounds applied within two (2) inches of the top edge of the rail in any downward or outward direction at any point along the top edge
 - b. At least ¼ inch in diameter (steel or plastic banding is acceptable)

- c. Flagged every six (6) feet or less with a high visibility material if wire rope is used
 - d. Inspected by the Responsible Person as frequently as necessary to ensure strength and stability
 - e. Forty-two (42) inches (plus or minus three (3) inches) above the walking/working level
 - f. Adjusted to accommodate the height of stilts, if they are in use.
2. Midrails shall be
 - a. Approximately halfway between the top rail and the floor, platform, runway, or ramp
 - b. Capable of withstanding a force of at least one hundred fifty (150) pounds applied in any downward or outward direction at any point along the midrails or other structural member
 3. Toe boards shall be
 - a. Four (4) inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp
 - b. Securely fastened in place and with not more than ¼ inch clearance above the floor level

Gates or removable guardrail sections shall be placed across openings of hoisting areas or holes when they are not in use to prevent access.

C. Personal Fall Arrest Systems

1. Personal fall arrest systems shall be issued to and used by employees as determined by the Responsible Person and may consist of anchorage, connectors, body harness, deceleration device, lifeline, or suitable combinations. Personal fall arrest systems shall:
 - a. Tie off to an independent lifeline which is securely attached to a structural member and have a separate lifeline when working from swing scaffolds, boatswain chairs, spider baskets, etc.
 - b. Use nylon or other non-conductive lanyards when working with electrical equipment
 - c. Limit the maximum arresting force to 1800 pounds
 - d. Be rigged so an employee cannot free fall more than six (6) feet or contact any lower level
 - e. Bring an employee to a complete stop and limit the maximum deceleration distance traveled to three and a half (3 ½) feet
 - f. Be strong enough to withstand twice the potential impact energy of an employee free falling six (6) feet (or the free fall distance permitted by the system, whichever is less)
 - g. Be inspected prior to each use for damage and deterioration
 - h. Be removed from service if any damaged components are detected
2. All components of a fall arrest system shall meet the ANSI (American National Standards Institute) specifications, and shall be used in accordance with the manufacturer's instructions.
 - a. The use of non-locking snap-hooks is prohibited

- b. D-rings and locking snap-hooks shall have a minimum tensile load of 5000 pounds, and be proof-tested to a minimum tensile load of 3600 pounds without cracking, breaking, or suffering permanent deformation.
- c. Lifelines (self-retracting and lanyards) shall be
 - 1) Designed, installed, and used under the supervision of the *Responsible Person*
 - 2) Protected against cuts and abrasions
 - 3) Equipped with horizontal lifeline connection devices capable of locking in both directions on the lifeline when used on suspended scaffolds or similar work platforms that have horizontal lifelines that may become vertical lifelines.
 - 4) Must have ropes and straps (webbing) made of synthetic fibers; and shall
 - 5) Sustain a minimum tensile load of 3000 pounds if they automatically limit free fall distance to two (2) feet
 - 6) Sustain a minimum tensile load of 5000 pounds (includes rip stitch, tearing, and deforming lanyards).
 - 7) Must have anchorages that support at least 5000 pounds per person attached and shall be:
 - a) Designed, installed, and used under the supervision of the *Responsible Person*
 - b) Capable of supporting twice the weight expected to be imposed on it
 - c) Independent of any anchorage used to support or suspend platforms.

D. Positioning Device Systems

Body harness systems shall be set up so that an employee can free fall no farther than two (2) feet, and shall be secured to an anchorage capable of supporting twice the potential impact load or 3000 pounds, whichever is greater. Requirements for snap hooks, d-rings, and other connectors are the same as detailed in this Program under *Personal Fall Arrest Systems*.

E. Safety Monitoring Systems

In situations when no other fall protection has been implemented, the *Designated Safety Monitor* shall monitor the safety of employees in these work areas. The *monitor* shall be:

- 1. Competent in the recognition of fall hazards
- 2. Capable of warning workers of fall hazard dangers
- 3. Operating on the same walking/working surfaces as the employees and able to see them
- 4. Close enough to work operations to communicate orally with employees
- 5. Free of other job duties that might distract them from the monitoring function.

No employees other than those engaged in the work being performed under the Safety Monitoring System shall be allowed in the area. All employees under a Safety Monitoring System are required to promptly comply with the fall hazard warnings of the *Designated Safety Monitor*.

F. **Warning Line Systems**

Warning line systems consisting of supporting stanchions and ropes, wires, or chains shall be erected around all sides of roof work areas.

1. Lines shall be flagged at no more than six (6) foot intervals with high-visibility materials.
2. The lowest point of the line (including sag) shall be between thirty-four (34) and thirty-nine (39) inches from the walking/working surface.
3. Stanchions of warning line systems shall be capable of resisting at least sixteen (16) pounds of force.
4. Ropes, wires, or chains must have a minimum tensile strength of five hundred (500) pounds.
5. Warning line systems shall be erected at least six (6) feet from the edge, except in areas where mechanical equipment is in use. When mechanical equipment is in use, warning line systems shall be erected at least six (6) feet from the parallel edge, and at least ten (10) feet from the perpendicular edge.

IX. Tasks and Work Areas Requiring Fall Protection

Unless otherwise specified, the *Responsible Person* shall evaluate the worksite(s) and determine the specific type(s) of fall protection to be used in the following situations:

- A. **Formwork and Reinforcing Steel** – twenty-five (25) feet or higher
Fall protection will be provided when an employee is climbing or moving at a height of over twenty-four (24) feet when working with rebar assemblies.
- B. **Scaffolding** – ten (10) feet or higher (See *NDSU Safe Operating Procedure – Scaffolding*)
- C. **Grain Handling Facilities** – six (6) feet or higher (See *NDSU Safe Operating Procedure – Grain Storage Operations & Maintenance*)
- D. **Hoist Areas** – six (6) feet or more
Guardrail systems or personal fall arrest systems will be used in hoist areas when an employee may fall six (6) feet or more. If guardrail systems must be removed for hoisting, employees are required to use personal fall arrest systems.
- E. **Holes** – four (4) feet or more
Covers or guardrail systems shall be erected on all unprotected sides or edges around holes (including skylights) that are six (6) feet or more above lower levels. If covers or guardrail systems must be removed, employees are required to use personal fall arrest systems.
- F. **Leading Edges** – six (6) feet or more
Guardrail systems, safety net systems, or personal fall arrest systems shall be used when employees are constructing a leading edge that is six (6) feet or more above lower levels. An alternative Fall Protection Plan shall be used if the *Responsible Person* determines that the implementation of conventional fall protection

systems is infeasible or creates a greater hazard to employees. All alternative Fall Protection Plans for work on leading edges will:

1. Be written specific to the particular jobsite needs
2. Include explanation of how conventional fall protection is infeasible or creates a greater hazard to employees
3. Explain what alternative fall protection will be used for each task
4. Be maintained in writing at the jobsite by the Responsible Person

G. Roofing – Commercial at six (6) feet or higher

1. *Low-Slope Roofs*

Fall protection shall be provided to employees engaged in roofing activities on low-slope roofs with unprotected sides and edges six (6) feet or more above lower levels. The type(s) of fall protection needed shall be determined by the *Responsible Person*, and may consist of guardrail systems, safety net systems, personal fall arrest systems, or a combination of a warning line system and safety net system, warning line system and personal fall arrest system, or warning line system and safety monitoring system. On roofs fifty (50) feet or less in width, the use of a safety monitoring system without a warning line system is permitted.

2. *Steep Roofs*

Guardrail systems with toe boards, safety net systems, or personal fall arrest systems will be provided to employees working on a steep roof with unprotected sides and edges six (6) feet or more above lower levels, as determined by the *Responsible Person*.

H. Wall Openings – six (6) feet or more

Guardrail systems, safety net systems, or a personal fall arrest system will be provided to employees working on, at, above or near wall openings when the outside bottom edge of the wall opening is six (6) feet or more above lower levels and the inside bottom edge of the wall opening is less than thirty-nine (39) inches above the walking/working surface. The type of fall protection to be used will be determined by the *Responsible Person*.

I. Ramp, Runways, and Other Walkways

Employees using ramps, runways, and other walkways six (6) feet or more above the lower level shall be protected by guardrail systems.

J. Stairway Railings and Guards

1. Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails, the width of the stair to be measured clear of all obstructions except handrails.
2. On stairways less than forty-four (44) inches wide having both sides *enclosed*, at least one handrail, preferably on the right side descending.
3. On stairways less than forty-four (44) inches wide, having one side *open*, at least one stair rail on the open side.

4. On stairways less than forty-four (44) inches wide, having both sides open, one stair railing on each side.
5. On stairways more than forty-four (44) inches wide but less than eighty-eight (88) inches wide, one handrail on each enclosed side and one stair railing on each open side.
6. On stairways eighty-eight (88) inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.
7. Winding stairways shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than six (6) inches.

K. Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms

1. A body belt or safety harness shall be worn and a lanyard attached to the basket or cage while working.
2. Employees shall always stand firmly on the floor of the boom or basket, and shall not climb on the edge of the basket or use planks, ladders, or other devices for a work position.
3. Platforms must be secured to the lifting carriage or forks of an industrial truck.
4. Platform width must be at least eighteen (18) inches.
5. Platforms must not exceed lift truck capabilities established by the manufacturer.

L. 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.

X. Protection from Falling Objects

When guardrail systems are in use, the openings shall be small enough to prevent potential passage of falling objects. The following procedures must be followed by all employees to prevent hazards associated with falling objects.

- A. No materials (except masonry and mortar) shall be stored within four (4) feet of working edges.
- B. Excess debris shall be removed regularly to keep work areas clear.
- C. During roofing work, materials and equipment shall be stored no less than six (6) feet from the roof edge unless guardrails are erected at the edge.
- D. Stacked materials must be stable and self-supporting.
- E. Canopies shall be strong enough to prevent penetration by falling objects.

- F. Toe boards erected along the edges of overhead walking/working surfaces shall:
1. Be capable of withstanding a force of at least fifty (50) pounds
 2. Be solid with a minimum of three and a half (3 ½) inches tall and no more than one quarter (1/4) inch clearance above the walk/working surface
 3. Not have equipment piled higher than the toe board unless sufficient paneling or screening has been erected above the toe board.

XI. 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 or by having someone call for the services. When work takes place at offsite locations, rescue procedures must be established before the work occurs.

XII. Accident Investigations

All accidents/incidents involving workers, as well as near misses, regardless of their nature shall be reported to the UP&SO. Investigations shall be conducted by the *Responsible Person* as soon after an incident as possible, or within 24 hours, to identify the causes and means of prevention to eliminate the risk of reoccurrence.

In the event of such an incident, the Fall Protection Program (and alternative Fall Protection Plans, if in place) shall be reevaluated by the Responsible Person to determine if additional practices, procedures, or training are necessary to prevent similar future incidents.

XIII. Changes to the Plan

Any changes to the Fall Protection Program (and alternative Fall Protection Plans, if in place) shall be approved by the *Responsible Person*, and shall be reviewed by a qualified person as the job progresses to determine additional practices, procedures or training needs necessary to prevent fall injuries. Affected employees shall be notified of all procedure changes, and trained if necessary. A copy of this plan, and any additional alternative Fall Protection Plans, shall be maintained at the jobsite by the *Responsible Person*.

XIV. Enforcement

Constant awareness of and respect for fall hazards, as well as compliance with all safety rules, are considered conditions of employment with North Dakota State University. The crew supervisor or foreman, as well as the *Responsible Person* or management, reserve the right to issue disciplinary warnings to employees, up to and including termination, for failure to follow the guidelines of this plan.

XV. Glossary

Anchorage: A secure point of attachment for lifelines, lanyards, or deceleration devices.

Body belt: A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

Body harness: Straps that may be secured about the person in a manner that distributes the fall-arrest forces over at least the thighs, pelvis, waist, chest and shoulders with a means for attaching the harness to other components of a personal fall arrest system.

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.

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

Controlled access zone: A work area designated and clearly marked in which certain types of work (such as overhand bricklaying) may take place without the use of conventional fall protection systems (guardrail, personal arrest, or safety net) to protect the employees working in the zone.

Deceleration device: Any mechanism, such as a rope, grab, rip stitch lanyard, specially-woven lanyard, tearing lanyard, deforming lanyard, or automatic self-retracting lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

Deceleration distance: The additional vertical distance a falling person travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which a deceleration device begins to operate.

Guardrail system: A barrier erected to prevent employees from falling to lower levels.

Hole: A void or gap two (2) inches (5.1 centimeters) or more in the least dimension in a floor, roof, or other walking/working surface.

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

Leading edge: The edge of a floor, roof, or formwork for a floor or other walking/working surface (such as a deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed or constructed.

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), that serves as a means for connecting other components of a personal fall arrest system to an anchorage.

Low slope roof: A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

Opening: A gap or void thirty (30) inches (76 centimeters) or more high, and eighteen (18) inches (46 centimeters) or more wide, in a wall or partition through which employees can fall to a lower level.

Personal fall arrest system: A system including but not limited to an anchorage, connectors, and a body harness used to arrest an employee in a fall from a working level.

Positioning device system: A body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning backwards.

Responsible Person: A person who has the authority to carry out the Fall Protection Program.

Rope grab: A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest a fall.

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

Self-retracting lifeline/lanyard: A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under minimal tension during normal employee movement and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snap hook: A connector consisting of a hook-shaped member with a normally closed keeper, or a similar arrangement, which may be opened to permit the hook to receive an object and, when released automatically, closes to retain the object.

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

Toe board: A low protective barrier that prevents material and equipment from falling to lower levels and which protects personnel from falling.

Unprotected sides and edges: Any side or edge (except at entrances to points of access) of a walking/working surface (e.g. floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches (1 meter) high.

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, formwork, and concrete reinforcing steel. Does not include ladders, vehicles, or trailers on which employees must be located to perform their work duties.

Warning line system: A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.