UNIVERSITY OF MINNESOTA
University Health and Safety

FALL PROTECTION PROGRAM

Effective: October 30, 2015

PURPOSE and SCOPE:

The purpose of this program is to establish guidelines to protect employees and others engaged in work activities that expose them to potential fall hazards from elevations or heights, such as rooftops, open sided floors or other elevated work surfaces. Personal fall protection is accomplished through engineering design, the use of fall protection systems, administrative controls, training, and enforcement. Outside companies contracted with the University are required to have their own fall protection program in compliance with all applicable OSHA regulations.

DEFINITIONS:

Administrative controls – are procedures and policies, such as restricting access to rooftops and postponing work during severe weather.

Anchorage or Anchor – a secure point of attachment for lifelines, lanyards, or deceleration devices for personal fall protection.

Body harness – personal fall protection equipment having straps made of synthetic webbing material that are secured about the worker to distribute fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders, with means for attaching it to other components of a personal fall arrest system.

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

Connector – a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or D-ring sewn into a body harness, or a snap hook spliced or sewn to a lanyard or self-retracting lanyard).

Dangerous equipment – equipment (such as chemical tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to workers who fall onto or into such equipment.

Deceleration device – any personal fall protection mechanism (such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines, etc.) which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on a worker during fall arrest.
Deceleration distance – the additional vertical distance a falling worker travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of a worker’s body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the worker comes to a full stop.

Equivalent – alternative designs, materials, or methods to protect against a hazard, which will provide an equal or greater degree of safety for workers than the methods, materials, or designs specified in the standard.

Free fall distance – the vertical displacement of the fall arrest attachment point on the worker’s body harness between onset of the fall and just before the system begins to apply force to arrest the fall. 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.

Guardrail system – a barrier erected to prevent workers from falling to lower levels.

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

Infeasible – impossible to perform the work using a conventional fall protection system (that is, guardrail system, safety net system, or personal fall arrest system); or technologically impossible to use any one of these systems to provide fall protection.

Lanyard – a flexible line of rope, wire rope, or strap used for personal fall protection which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

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 which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

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

Lower levels – those areas or surfaces to which a worker can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Opening – a gap or void 30 inches or more high and 18 inches or more wide, in a wall or partition, through which workers can fall to a lower level.

Personal fall arrest system – a system used to arrest a worker in a fall from a working level. It consists of an anchorage, connectors, lanyard or self-retracting lifeline (SRL) and a body harness.
Personal fall restraint system – a system used as a means of prevention. It consists of an anchorage, connectors, lanyard, lifeline, and a body harness, and is rigged to restrict the worker’s travel to not allow the worker to extend over an unprotected edge, thereby preventing a fall from occurring.

Qualified – one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

Rope grab – a personal protective fall deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of a worker. A rope grab usually employs the principles of inertial locking, cam/level locking, or both.

Self-retracting lifeline (SRL) – a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal worker movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snaphook – personal protective device attached to a lanyard used to secure lanyard to body harness and anchorage or lifeline. The hook part of the device must incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. A snaphook must automatically lock and remain closed until unlocked and pressed open by the worker.

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

Swing falls – a dangerous pendulum swing that may result when a worker moves horizontally away from an anchor point and falls. The arc of the swing may produce significant speed that can propel the worker into an obstruction, causing injury or death.

Toeboard – a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide workers protection from falls.

Unprotected sides and edges – any side or edge (except at entrances to points of access) of a walking or working surface (for example, floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches high.

Walking/working surface – any surface on which a worker walks or works, including but not limited to floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel; but not including ladders, vehicles, or trailers, on which workers must be located in order to perform their job duties.

Warning line system – a barrier made of ropes, wires, or chains with supporting stanchions (posts) erected at a minimum of 15 feet from the closest unprotected edge, used to warn workers that they are approaching an unprotected roof edge, hole, opening, or other edge.

Work area – that portion of a walking or working surface where job duties are being performed.
PROGRAM COMPONENTS:

1. Responsibilities
2. General requirements
3. Employee Training and communication
4. Fall Protection Methods and Equipment

1. RESPONSIBILITIES

Managers
- Ensure that this Program is implemented by supervisors and employees assigned to work in locations where workplace-related falls could occur.
- Ensure that fall protection equipment is readily available for employee use.
- Correct any unsafe practices or conditions immediately.
- Contact University Health & Safety in the event of questions or if assistance is needed.
- Enforce the use of safe work practices, including the proper use of fall protection equipment.

Supervisors
- Ensure that procedures relating to this Fall Protection Program are implemented by all employees under their supervision.
- Ensure the necessary fall protection equipment is readily available for employee use.
- Ensure all affected employees have attended initial training and any refresher training.
- Contact University Health & Safety in the event of questions or if assistance is needed.
- Communicate and enforce the use of safe work practices, including the proper use of fall protection equipment.

Employees
- Understand and follow the safe work procedures relating to the Fall Protection Program.
- Immediately report any unsafe hazards or situations – including any defective, damaged, or unsuitably worn equipment - to your supervisor, and contact University Health & Safety if additional assistance is needed.
- Participate in the initial and refresher training sessions.

2. GENERAL REQUIREMENTS

Employees in general are to be protected from potential fall hazards of four (4) feet or more, or at any height above dangerous equipment. Workers involved in construction must be protected from potential fall hazards of six (6) feet or more, or at any height above dangerous equipment. Fall hazards from elevations include, but are not limited to, the unprotected sides and edges of the following situations:
- Open sided floors, platforms, roofs and walkways
- Regardless of height, any open sided floor, platform, walkway, ramp etc. above dangerous equipment
- Floor holes and openings
- Wall holes and openings, including debris chutes and open windows.
- Hoist areas
The first priority for reducing or eliminating exposure to falls is to be given to engineering controls, such as moving the work to ground level, followed by guardrails or equivalent barriers to prevent falls. Hazards may also be reduced through the use of properly-rigged scaffolding or aerial lifts. Where such are not available or feasible, warning lines and personal fall protection systems are to be employed. Protection from falling objects must also be provided in the form of toeboards, canopies, and other suitable means. Stairways and access points must be kept clear of tools, equipment, supplies, and debris. Three key steps to preventing falls are to:

1. PLAN ahead for how to do the job safely. What tasks will need to be accomplished, what equipment and tools will be needed to perform those tasks?
2. PROVIDE the right equipment that was identified during the planning stage, whether that is scaffolding, aerial lifts, guardrails, warning lines, or personal fall protection.
3. TRAIN everyone to recognize hazards and how to use the equipment properly.

Only those employees with a legitimate University business need are to access rooftops or other locations that lack standard guardrails or the equivalent. Qualified workers who are inspecting, investigating, or assessing workplace conditions prior to the actual start of work or after all construction work has been completed are exempt from the other requirements of this program, but are expected to remain as far from exposed (unprotected) edges as possible and to remain focused on their surroundings.

Visitors must have a legitimate business need to be granted access to rooftops and other exposed work areas; the department coordinating these activities is to ensure that visitors are protected from fall hazards by the methods outlined in this program.

Work should be postponed and persons removed from rooftops and other exposed work locations when hazardous conditions exist, such as severe weather conditions (high winds, lightening, snow storms, etc.) or other hazardous conditions could potentially result such as building fires or accidental chemical releases.

3. EMPLOYEE TRAINING and COMMUNICATION
All employees who may be exposed to potential fall hazards will be trained on how to recognize such hazards, and how to minimize their exposure to them. Employees will receive training as soon after employment as possible, and before they are required to work in areas where fall hazards exist. Training records will be maintained by the operating unit.

4. FALL PROTECTION METHODS AND EQUIPMENT
The appropriate fall protection will be determined by the situation and task to be performed. Examples include:

Guardrail Systems
Guardrail systems are barriers erected to prevent workers from falling to lower levels. Guardrails must meet certain height, strength, and other design requirements, including
having a top rail 42-inches (plus or minus 3 inches) above the walking surface capable of supporting a minimum of a 200 pound force, along with a mid-rail or equivalent, and if employees or members of the public are below the elevated work surface, a 4 inch high toeboard. If materials are piled higher than a toeboard, then paneling or screening is required. Hoist area access points must be protected with either a guardrail, a gate, or chains. Rooftop parapets that are a minimum of 39-inches above the walking surface and are in good condition are equivalent to a guardrail. Fixed ladder side rails or ladder extensions must extend 3 1/2 feet above parapets and landings. Personal fall protection must be used to prevent workers from falling through opened railings and gates, such as when hoisting materials, or if leaning through a railing, gate, or chains.

Holes and openings in walking surfaces and walls need to be protected with guardrails, or with covers that will support the weight of the intended load (people and/or equipment). If covers are used to protect floor or wall openings, the covers must be secured against displacement and labeled “Floor/Wall Opening – Do Not Remove”. Openings include skylights since the fiberglass, acrylic, polycarbonate, or other “plastic” covers are not designed to support a person’s weight. Rooftop access hatches are to be protected with guardrails, and with gates or offset guardrails to prevent a person from walking directly into the opening. One side of the hatch can be protected by the hinged cover that locks in an upright position.

Aerial lifts and scaffolding platforms must be protected with guardrails and a gate or chains at the access point. Workers are to stand only on the platform working surface and not on the rails, buckets, planking, or ladders. Personal fall protection is required when using telescoping or articulating aerial lifts. Scaffolds must be erected and inspected daily before use by individuals that are trained and certified in scaffold erection. Scaffold platforms must be fully-planked with suitable materials, and access must be by steps or ladders.

**Warning Line Systems**
A warning line system is a barrier made of ropes, wires, or chains with supporting stanchions (posts) used to warn workers that they are approaching an otherwise unprotected roof edge, hole, skylight, opening, or other edge. Warning lines are to be erected a minimum of 15 feet from the closest unprotected edge. Warning lines are sometimes used in conjunction with guardrails. Workers are NOT allowed to go past a warning line or a guardrail without the use of personal fall protection equipment. Note that roofing companies may use alternate means, only for workers engaged in roofing work.

Warning lines must be attached to each stanchion, so that excessive slack isn’t taken up in other stanchions, and flagged every 6 feet with high-visibility material. The lowest point of sag is to be not less than 34 inches above the walking surface, and the highest point not more than 39 inches above the surface. Stanchions must meet strength and durability design standards to resist tipping over.

**Safety Net Systems**
If a safety net system is used, it must be installed as close as practicable under the walking or working surface, be installed with sufficient clearance underneath to prevent a falling person from hitting the surface or structure below the net, and must meet several other strength and design requirements.
Personal Fall Protection Systems
These systems consist of either fall arrest, which stops a person during a fall, or fall restraint, which keeps a worker from falling at all. Personal fall protection is to be used any time a fall hazard exists that cannot be engineered out or protected by guard railing or a warning line. Personal fall arrest systems are designed for fall protection from unprotected heights of 6 feet or more or at any height above dangerous equipment. Whenever possible, fall restraint is to take precedence over fall protection, in order to lessen the likelihood of the need for rescue and associated fall-related trauma. Users should read and understand all manufacturer instructions, which accompany new equipment and are available from the manufacturer.

Only manufactured personal fall protection system components designed for personal fall protection can be utilized. Personal fall protection system components consist of a body harness, lanyard and a deceleration device, lifeline and anchorage. Personal fall protection anchors must be designed, installed, and certified for use in fall protection, or be a structural member capable of supporting at least 5,000 pounds per worker. Lifelines include:

- Vertical Lifelines – When a vertical lifeline is used, each employee must have a separate lifeline. Vertical lifelines include:
  - Vertical lifeline consisting of a synthetic rope having a minimum breaking strength of 5000 pounds and a rope grab.
  - Self-retracting lifeline (SRL) which automatically locks up to limit free fall distance to 2 feet or less.
- Horizontal lifelines - allow a worker to travel along a surface while remaining attached 100-percent of the time.

Compatibility of Components: Since not all components are interchangeable, any substitution or change to a personal fall arrest system should be fully evaluated by a competent person before the modified system is put in use. For instance, a lanyard should not be connected between a harness and a SRL (self-retracting lifeline) since this can result in additional free fall for which the system was not designed.

Fall protection equipment is never to be used for other purposes, such as hoisting or pulling. Components such as lifelines and tie-off adaptors need to be protected against being cut or abraded. Workers using a bosun/boatswain chair require a personal fall arrest system connected to a separate, independent anchor.

Personal Fall Arrest Systems
A personal fall arrest system is a system used to safely stop (arrest) a worker who is falling from a working level. It consists of an anchorage, connectors, lanyard or self-retracting lifeline (SRL), and a body harness.

Fall clearance must be calculated to ensure a minimum of 1.5 feet clearance between any part of a falling worker and any dangerous projections or the surface below. Swing fall hazards are to be reduced by ensuring that anchor points are overhead of the worker at all times, and by raising the height of the anchor point to reduce the angle of the arc to no more than 15 degrees in any direction.

Personal Fall Restraint (Travel Restraint) Systems
A fall restraint system prevents a fall from occurring by being rigged to allow movement of the worker only as far as the edge of the walking/working surface, so the worker cannot go over the edge. The need for rescue should be eliminated if the system is used correctly.

A fall restraint system consists of an anchorage, connectors, lanyard, lifeline, and body harness as described above – except that a self-retracting lifeline may **not** be used. It is to be rigged to not allow the worker to extend over an unprotected edge, thereby preventing a fall from occurring. The anchorage for a restraint system needs to withstand at least 3,000 lbs. or twice the maximum expected force.

**Rescue**

After a fall, a worker may not be able to rescue themselves and may remain suspended. Suspension trauma results from blood pooling and lack of circulation, and can lead to unconsciousness and death. Symptoms can occur after rescue; therefore, anyone who experiences a fall requires immediate medical attention. Fall restraint, as opposed to fall arrest, should be used whenever possible to prevent a fall from occurring, although a rescue plan is required nevertheless.

Prior to the start of work, a plan needs to be developed and communicated to all workers for the prompt rescue in the event of a fallen worker. Part of the rescue plan is to ensure that each body harness is equipped with suspension trauma straps for a worker to stand on to relieve stresses on the body while awaiting rescue, and that each worker using a harness knows how to use the straps while periodically “pumping” their legs to increase blood circulation. Workers using a personal fall protection system must not work alone, and workers who are not being suspended need to be able to contact 9-1-1.

**Personal Fall Protection Cleaning and Storage**

Cleaning and storage should be performed according to manufacturer instructions, which accompany new equipment and are available from the manufacturer. Webbing materials should be cleaned using water and a mild detergent solution. Wipe off hardware with a clean, dry cloth, and hang to air dry. Do not force dry with heat. Store equipment in a cool, dry, clean environment out of direct sunlight and away from areas where chemical vapors may exist.

**Personal Fall Protection Inspections**

Users are to inspect personal fall protection systems before each use. Inspections should be performed according to manufacturer instructions, which accompany new equipment and are available from the manufacturer. Check for any signs of damage, defects, or indications that equipment may have been used in a fall or for improper uses. Personal fall protection that is defective, damaged, or which has undergone a shock load from a fall arrest must be immediately removed from service and reported to the supervisor in charge.

**LEGAL REFERENCES:**

29 CFR 1926.501, 502, 503
29 CFR 1910.23
MN 5207.0250