Fall Protection Policy

Applicable Legislation:

O. Reg. 851, R.R.O. 1990, Industrial Establishments, Section 85
O. Reg. 213/91 Construction Projects, Section 26, Section 207
O. Reg.145/00 Regulation to Amend O. Reg. 213/91

Relevant Standards:

CSA Standard, *A Guide to Fall Protection, 1996*
CSA Standard, *CAN/CSA-Z259.10-M90: Full Body Harnesses*
CSA Standard, *CAN/CSA-Z259.11-M92: Shock Absorbers for Personal Fall Arrest Systems*
CSA Standard, *Z259.2.1-M98: Fall-Arresting Devices, and Vertical Lifelines*
CSA Standard, *Z259.2.2-M98: Self-Retracting Devices for Personal Fall-Arrest Systems*
CSA Standard, *CAN/CSA-Z259.1-M99: Safety Belts and Lanyards*
CSA Standard, *CAN/CSA-Z259.2.3-M98: Descent Control Devices*

Intent:

To summarize requirements for fall protection in University workplaces.

Definitions:

anchorage point

a secure point of attachment for lifelines, lanyards, or deceleration devices that is independent of the means of supporting or suspending the employee.

buddy system

a system of organizing employees into work groups so that each employee of the work group is designated to be observed by at least one other employee in the work group.

fall arrest system

an assembly of components joined together so that when the assembly is connected to a fixed support, it is capable of arresting a worker’s fall; consists of a full-body harness with back-mounted “D”ring, a shockabsorbing lanyard, a lifeline, connecting hardware and anchorage point(s). A potential for injury will exist if the worker falls.

fall protection

specialized personal protective equipment designed to prevent falls from height or to bring a worker to a safe and controlled stop after falling.

fall restricting system

a type of fall arrest system that has been designed to limit a worker’s fall to a specific distance.

guardrail system

an assembly of components joined together to provide a barrier to prevent a worker from falling from the edge of a surface.

kilonewton (kN)

a unit of force, approximately equivalent to 225 pounds of force.

safety net

a safety net that complies with O.Reg.213/91, section 26.8, and is located and supported in such a way that it assists the fall of a worker who may fall into it without endangering the worker.

swing-fall

the hazard of swinging into an obstruction after falling.

travel restraint system

an assembly of components capable of restricting a worker's movement on a work surface and preventing the worker from reaching a location from which he or she could fall; equipment designed to keep a person away from the location of the fall hazard; a mechanism which restricts the movement of a worker on a work surface; consists of a full-body harness, a lifeline or retractable lanyard, and an anchorage point; also referred to as fall restraint.

Requirements of O. Reg. 851 for Industrial Establishments, Section 85

85. Where a worker is exposed to the hazard of falling and the surface to which he or she might fall is more than three metres below the position where he or she is situated,

1. the worker shall wear a serviceable safety belt or harness and lifeline adequately secured to a fixed support and so arranged that the worker cannot fall freely for a vertical distance of more than 1.5 metres, and
2. the fall arresting system described in clause (a) shall,
    1. have sufficient capacity to absorb twice the energy and twice the load that under the circumstances of its use may be transmitted to it, and
    2. be equipped with a shock absorber or other devices to limit the maximum arresting force to 8.0 kilonewtons to the wearer.

Requirements of O. Reg. 213/91 for Construction Projects, Section 26, Section 207

26.(1) Unless a safety net or travel restraint system is being used, a worker shall wear a fall arrest system if the worker may fall,

1. a distance of more than three metres;
2. more than 1.2 metres, if the work area is used as path for a wheelbarrow or similar equipment;
3. into operating machinery;
4. into water or another liquid; or
5. into or onto a hazardous substance or object;
6. through an opening on a work surface.

(3) A fall arrest system,

1. shall be adequately secured to a fixed support or to a lifeline that is securely fastened to the project;
2. shall be arranged that if the wearer falls, the wearer will be suspended not more than 1.5 metres below his or her location before the fall; and

3. shall apply a peak fall arrest force not greater than eight kilonewtons to the wearer.

(4) A fixed support shall be capable of resisting the arrest forces in case of a fall and be free of sharp edges that might cut or chafe the connection between the fall arrest system and the fixed support.
(5) A lanyard used in a fall arrest system shall have a nominal diameter of at least sixteen millimetres and be made of nylon rope or other durable material of equivalent impact strength and elasticity.
(6) A lifeline in a fall arrest system,

1. shall have a nominal diameter of at least sixteen millimetres and be made of polypropylene or other durable material that provides at least equal protection to the user;
2. shall extend to the ground or be provided with a positive stop that prevents the connection from the fall arrest system to the lifeline from running off the end of the lifeline;
3. shall be connected to an object that is capable of resisting the arrest forces in case of a fall;
4. shall be free of knots, splices and imperfections;
5. shall be used in such a way that it is not likely to be cut or chafed; and
6. shall be used by only one person at a time.

207.(1) If a built-up roof is being constructed, repaired or resurfaced, a barrier shall be placed in the immediate work area at least two metres from the perimeter of the roof.
(2) The barrier shall consist of portable weighted posts supporting taunt chain, cable or rope that is located 1.1 metres above the roof level.

Policy:

1. The University shall, whenever feasible, eliminate the need for work at elevations that present fall hazards and/or shall implement engineering solutions to create safe work environments for employees and contractors.
2. Fall protection strategies (e.g. enclosures, barriers and guardrail systems, protective coverings, travel restraint systems or fall arrests systems) shall be adopted by supervisors and employees and contractors wherever there is a fall- from-height risk that cannot be mitigated. (A fall-from-height risk can exist at heights exceeding 0.6 metres or 2 feet.)
3. Employees shall be trained on the selection, use, care, inspection and proper storage of fall protection components and systems and shall be instructed about those circumstances (e.g. falls exceeding 0.6 metres) where equipment shall be removed from service, inspected by the manufacturer, and/or destroyed. Training records shall be maintained in accordance with *O. Reg. 145/00*.
4. Contractors shall provide written fall protection strategies to the University Project Manager or co-ordinator whenever the work site presents fall-from-height hazards. (This documentation may be part of the contractor's **Safety Management Plan**. See Safety Policy 851.01.08 [1] concerning Contracting Work.)
5. All fall arrest system components and travel restraint system components shall be CSA-approved.
6. Fall arrest systems shall be used by University employees, students and contractors whenever a fall-from-height risk cannot be eliminated.
7. Fall arrest system components and travel restraint system components shall be inspected by a competent worker before and after each use. Defective components shall be taken out of service immediately.
8. Temporary anchorage points for travel restraint and fall arrest shall be selected with professional engineering assistance. Permanent anchors shall be installed according to the Building Code and shall be conspicuously labelled for the purpose and with load capacity information.
9. In accordance with *O.Reg. 145/00*, a written rescue plan for fallen workers shall be provided by the workplace supervisor in advance of all work requiring a fall arrest system. Rescue training shall be provided.
10. Buddy systems shall be required whenever fall arrest systems are necessary for employee protection. (Spotters watch workers performing duties near a fall hazard and would activate emergency rescue plans.)
11. Hazardous work permits (as per guidelines in Safety Policy 851.01.08), written fall protection strategies, administrative controls, job safety meetings prior to work, and warnings shall be used by University project managers and project co-ordinators to alert employees and contractors about fall hazards.

Guidelines:

Every year in Canada there are about 26,000 lost-time injuries resulting from falls from heights, and each year over one hundred workers lose their lives in falls. Most of the injuries occur in industries where the fall hazard and the need for fall protection are not well recognized. Over 90% of falls from height happen to workers who are not protected. Approximately 33% of all fatalities are from heights less than six metres (i.e. below the height of an average extension ladder!). Equipment failure is not a common cause of fall injuries. Falls are associated with the costliest of all workers' compensation claims.

The earth's gravitational field accelerates free falling objects at the rate of 9.8 m/sec2 or 32.15 feet/sec2. The following table illustrates how far you can fall in a very short period of time if you lose your balance:

time (sec)	distance (meters)	distance (feet)
0.5	1.2	4
1.0	5	16
2.0	20	64
4.0	78	257

Fall protection is used to prevent tragedy because you can't rely on your reaction time to regain balance. Workers can lose their balance and fall due to slippery surfaces or unexpected changes to the walking surface, poor lighting, tripping hazards, spills, or activities such as pulling, pushing, and manual material handling.

Fall protection in the workplace addresses two basic questions: Is a worker at risk of falling? What must be done for fall protection? Supervisors and employees must agree to a fall protection strategy whenever the workplace presents fall-from-height risks. The approach to fall protection proceeds as follows:

1. eliminate the fall-from-height risk;
2. prevent a fall-from-height by using barriers, guardrail systems, protective coverings, work platforms, or travel restraint systems;
3. employ fall-arrest systems when the first two approaches are not feasible.

Travel restraints systems prevent workers from getting too close to an unprotected edge. They incorporate a full-body harness and a lanyard attached to an anchorage point. Selfretracting lifelines or horizontal lifelines are used in travel restraint systems.

Fall arrest systems are required for anyone who:

- faces a fall-from-height hazard exceeding three metres (3 m);
- works over operating machinery;
- works over water or another liquid or a hazardous substance;
- may fall through an opening on a work surface.

They are used when travel restraint systems are not feasible. These systems are professionally designed to provide vertical fall arrest, horizontal travel restraint, or a combination of both for work on sloped surfaces. Users of this protective equipment still face the fall hazard; it is the impact force at the end of a fall that is being controlled. **A fall does not injure or kill; rather it is the sudden stop at the end that causes the damage!**

The distance of any free fall must be minimized in order to minimize the fall arrest force on the body. The prescribed free fall distance is 1.5 metres so that the maximum arrest force on the body does not exceed 8 kilonewtons (i.e. 1800 pounds, approximately equivalent to the weight of a Volkswagen Beetle!). This maximum arrest force is based on medical and biomechanical research. The limit is considered safe provided it is applied upward through the worker's sub-pelvic area, the worker's overall physical condition is good and the direction of the maximum arrest force is limited to a fraction of a second.

Any free fall smaller than 1.8 metres (6 feet) will generate no more 4 kilonewtons provided the worker's weight, including clothing and tools attached to the harness, does not exceed 100 kg (220 pounds).

Fall arrest systems consist of approved full-body harnesses, connecting subsystems, and anchorage points. The CSA standard for full-body harnesses allows for several varieties (e.g. the H-style and the X-style), but they must

all be equipped with a dorsal mounted “D”-ring for fall arrest. (Safety belts must never be used in fall arrest systems.) The manufacturer’s label on the harness will indicate a classification in accordance with the CSA Standard: Group A for fall arresting, Group D for controlled descent, Group E for confined space entry (raising and lowering), Group L for ladder climbing and Group P for work positioning or travel restraint. Harnesses in every group must be suitable for fallarrest and must meet the requirements for Group A.

A lanyard is used to secure a full body harness to a lifeline or anchor. A fall arrest lanyard must have a shock absorber which prevents energy from being transferred to the worker’s body via the fall-arrest process. Shock-absorbing lanyards stop a fall within 1.5 metres and are designed to limit body forces to 4 kilonewtons when applied via the harness through the worker’s sub-pelvic area.

A lifeline is used to guide a fall arrest device. Lifelines may be horizontal or vertical depending on the nature of the work. The design and installation of horizontal lifelines must be carried out under the supervision of a professional engineer because the forces and fall distances typically exceed those encountered in vertical fall arrest systems. Vertical lifelines should not exceed 300 feet in length. Fall arresting devices such as rope-grabs are attached to vertical lifelines. Rope-grab fall arresters on vertical lifelines should stop after no more than 0.9 meters (3 feet) of travel.

Anchorages are parts of structures that happen to be located in the immediate vicinity of the workplace. They are not manufactured to technical standards . Every anchorage point for the fall-arrest system must have appropriate strength, stability and location. Assess the location of the anchorage for potential swing-fall and subsequent contact with neighbouring objects. Take into account the deployment of the shock absorber, your height, sliding of the D-ring, and the elastic stretch of the lifeline. Anchorage points may be permanent or temporary. Permanent, marked anchorages should be inspected every twelve months. An anchorage point for vertical fall arrest must be capable of withstanding a force of 22 kilonewtons. Horizontal anchorage points for a fall arrest system must withstand 71 kilonewtons. Anchorage points for travel restraint systems require a capacity of only 4 kilonewtons. Temporary anchorages must be capable of withstanding 8 kilonewtons.

The entire fall arrest system is only as good as the weakest link. Falls must be anticipated and rescue methods must be devised to help a fallen worker suspended by the fall-arrest system used.

A rescue plan must be developed in advance of work that involves a fall hazard. Fall victims must be rescued promptly. If the victim is not breathing, you have approximately four minutes before there is permanent brain damage due to lack of oxygen. If the victim is breathing but suspended motionless in a harness, you have perhaps 15 to 30 minutes before restricted blood circulation from harness strap pressure causes injury.

Possibilities for rescue include self-rescue, rescue by co-workers, and rescue by a professional rescue team. Rescue training is necessary for workers using fall arrest systems.

Ten Essential Principles for Users of Fall Arrest Systems (FAS)1.

1. Inspect your equipment before every use.
2. Don and adjust your harness properly.
3. Use your shock absorber or your shock-absorbing lanyard whenever possible.
4. Connect all components of your FAS using only compatible connecting hardware.
5. Attach your FAS only to a suitable anchorage.
6. Keep your fall distance to a minimum.
7. Consider the conditions of your workplace when choosing your equipment.
8. Care for your equipment as you would care for yourself.
9. Know the rescue procedure and equipment in case you should fall.
10. Be properly trained to use any fall protection equipment.

Strategies to Eliminate the Risk of Falls from Heights

Remove the reason for work at heights;
Move the task to floor or ground level;
Ensure that the elevated workplace is capable of supporting your weight;
Install permanent safe access to the elevated workplace;
Install walk-ways and guardrails;

Build safe work platforms or use a lift cage;
Enclose the elevated workplace;
Install permanent rigid covers over openings and/or erect barriers or guardrails;
Select anchorage points carefully for fall restraint and fall arrest systems.

Strategies to Eliminate Slips and Falls on the Ground

Apply an anti-slip floor finish;
Brightly mark differences in floor elevation on walkways;
Install anti-slip treads on stairs;
Mop-up puddles and spills promptly;
Keep floors clean and dry;
Wear slip-resistant footwear for good traction;
Use handrails and walk carefully;
Ensure adequate illumination;
Clear snow and ice on walkways and entrances.

Reference:

1. Sulowski, A. Fall-Arrest Systems-Practical Essentials. CSA International, Toronto, 2000.

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