DALHOUSIE UNIVERSITY *Inspiring Minds*	Policy Sponsor:	Approval Date: January 2016
Fall Protection Program For Working on Flat Roofs	Responsible Unit: Facilities Management	Revisions:

1. Introduction

Facilities Management employees are required to work on equipment that is located on campus buildings with flat roofs. Many times the work area is close to unprotected roof edges that are more than 3.0 meters (10.0 ft) above a safe surface. In such situations a false sense of safety can prevail simply because the roof is flat. In actual fact these unprotected edges constitute a fall hazard and the risk of falling is high. To ensure employee safety fall hazard control measures must be implemented.

2. Purpose

The purpose of this program is to ensure that acceptable / approved fall protection systems and procedures are implemented by Facilities Management employees when performing work on flat roofs in close proximity to unprotected roof edges.

When properly implemented the fall protection control measures recommended in this program will ensure employee safety while at the same time allowing employee's the freedom of movement required to perform their job.

3. Application

This program applies to all Facilities Management employees, other Dalhousie University employees, staff and students and any other persons accessing flat roofs on Dalhousie buildings.

In addition, contractors hired by Facilities Management to perform work on flat roofs at Dalhousie University must have a safety program that as a minimum meets the requirements of this program in providing protection of employees working on flat roofs.

This program applies to work on flat roofs only. Work on any other type of roof must be performed in accordance with the Facilities Management Fall Protection Program and approved Facilities Management procedures.

4. Definitions

“control zone” means the distance between an unguarded edge of a building or structure, where a fall hazard exists, and a line which is set back a safe distance of 2 metres (6.5 feet).

“fall-protection system” means any secondary system that is intended to prevent a person from falling or arrests a fall that occurs, and includes guardrails, temporary flooring, travel-restraint systems, personnel safety nets and fall-arrest systems;

“fall hazard” exists where an employee is at risk of falling from a work area where the fall distance is:

- 3.0 meters or more above the nearest safe surface or water; or,
- less than 3.0 meters and the work area is above 1 of the following:
    - a surface or thing that could cause injury to the person on contact that is worse than an injury from landing on a solid flat surface,
    - exposed materials in open tanks, pits or vats

“flat roof building” means a building with a roof that slopes less than 5%.

“guardrail” means a fall-protection system consisting of vertical and horizontal members that

(i) are capable of withstanding concentrated forces, as prescribed in Part 21: Fall Protection of the Workplace Health and Safety Regulations, or, the appropriate CSA standard,

(ii) warn of a fall hazard, and

(iii) reduce the risk of a fall;

“horizontal lifeline” means a flexible line made from wire, fibre rope, wire rope, or rod, with end terminations at both ends, that extends horizontally from one end anchorage to another;

“personnel safety net” means a fall-protection system that uses at least 1 net to stop a person who is falling before the person makes contact with a lower level or obstruction;

“lanyard” means a flexible line or strap used to secure a full-body harness to an energy absorber, fall-arrester, lifeline or anchorage;

“travel restraint system” means a fall-protection system that will prevent a person from reaching an unprotected edge or opening;

5. References

Part 21: Fall Protection; Nova Scotia Workplace Health and Safety Regulations

CSA standard CSA Z259.13, “Flexible Horizontal Lifeline Systems”.

CSA standard CSA Z259.16, “Design of active fall-protection systems”.

CSA standard CSA Z259.10, “Full Body Harnesses”.

CSA standard CSA Z797-09; “Code of Practice for Access Scaffolds

University of Guelph, Physical Resources Work at Heights Program – Appendix A; “Roof Work on Flat Roof Surfaces (Slope of less than 3/12 on existing roof structures, not new construction)”

Workers Compensation Board of PEI; Guide for Control Zones for Flat Roofing (Warning Line Systems)

6. Responsibilities

The following responsibilities relate specifically to employees working on flat roofs. They are in addition to the responsibilities defined in the Dalhousie University Occupational Health and Safety Program for each employee’s position.

<u>Supervisors and / or Forepersons</u>

Supervisors and Forepersons must ensure that:

- when necessary, emergency jobsite procedures are developed for specific work locations and all employees involved in working on the roof must be informed of the procedures.

- hazards have been identified and eliminated or appropriate control measures have been implemented.

- employees do not enter control zones unless it is necessary and only then with the use of proper fall protection.

- requirements for working within “Control Zones” are followed at all times.

- only authorized employees enter work areas or “Control Zones.”

Employees shall:

- follow all requirements and procedures for working on flat roofs

- follow any special safe job procedures developed for the roof on which they are working.

- use existing and / or required fall protection equipment if they have to work within the control zone.

7. Building Description and Hazard Identification and Assessment

A Building Description and Roof Hazard Assessment form must be completed for each Dalhousie University building with a flat roof and there is a high risk of falling due to equipment location and working conditions. Hazards are to be identified and appropriate control measures must be developed.

When planning for job on a flat roof, if “Working at Heights” is checked in the Work Related Hazards section of the Pre-Job Hazard Assessment form any existing Building Description and Roof Hazard Identification and Assessment form must be reviewed and updated if necessary. If a Building Description and Roof Hazard Identification and Assessment form does not exist one must be completed. All employees involved in the job must be informed, prior to starting work, about the hazards that exist and the control measures to be implemented before work begins.

A new form must be completed for each newly constructed or newly purchased building or any building with a slopped roof that is converted to a flat roof that meets the definition of a flat roof.

The Building Description and Roof Hazard Assessment form must be updated whenever equipment requiring servicing is removed, relocated, altered or added to, or, any other changes are made to the roof.

If a hazard is identified and it requires the use of special safety measures or personal protective equipment a warning sign is to be posted at access points to the roof to identify the location of the hazard and alert employees as to the need for specific personal protective equipment.

Hazards specific to changing seasons and weather conditions are a critical factor when working on any roof and must be considered and dealt with as part of the hazard identification process.

Written safe work instructions must be completed for all jobs that require an employee to work within control or buffer zones.

8. Controlling Falling Hazards

Depending on the proximity of a work area to the unprotected edge of a flat roof one or more of the following types of fall protection must be used to ensure employee safety.

- Control Zones
- Guardrails – portable prefabricated guardrails systems or wooden guardrails
- Portable prefabricated guardrail systems, installed as specified by the manufacturer, may also be used to provide temporary or permanent roof edge protection.
- A properly installed and used travel restraint system.

Where there are uncovered openings in a roof surface guardrails must be erected around the opening as fall protection. (See Section 10)

9. Control Zones[1]

A control zone is an area that extends from the unguarded edge, from which an employee could fall off a building or structure to a line set back a safe distance of 2.0 meters from that edge. A control zone is used on flat roofs as a form of fall protection for employees working within 2.0 meters of an unguarded edge that is 3.0 meters or more above the nearest safe surface.

If an employee works within 2.0 meters of a control zone, or, in other words within as much as 4.0 meters from the unguarded edge, a raised warning line or equally effective means of alerting the employee of the unguarded edge

must be used. The raised warning line must be positioned at least 2.0 meters from the unguarded roof edge.

If the flat roof is less than 4 meters wide a control zone shall not be used as a means of fall protection. In such cases an alternative form of fall protection, such as permanent or temporary guardrails or travel restraint must be used.

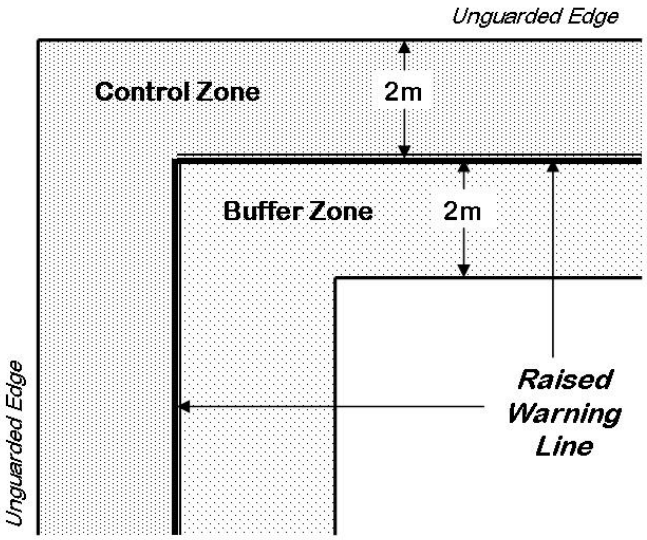

Figure 1 – Example of a Control Zone

Warning lines are not intended to prevent access to the control zone. Their purpose is to provide a visual and physical reminder of the fact that the hazard (edge of the roof) exists.

Warning lines must be made of rope, wire or chain and supported by stanchions. The stanchions must have bases that are sufficiently weighted or anchored in place to prevent them from being knocked over. After being rigged with warning lines stanchions must be able to resist a force of at least 20 lbs applied horizontally without tipping over.

The warning lines must:

- Be marked with a highly visible warning flag or sign at intervals that are preferably less than but do not exceed 2 meters,

- Be rigged and supported so that the lowest point (including sag) is not less 0.9 meters (34 inches) from the walking or working surface and its highest point is not more than 1.2 meters (45 inches) from the walking or working surface.

- Be attached to 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 the adjacent section before the stanchion tips over,

- The rope, wire or chain must have a minimum tensile strength of 2.2 kN (500 lbs).

Stanchions and any rope, wire or chain used as warning lines must be inspected annually and replaced if they start to wear.

Painted lines are not sufficient on their own as warning lines they must be used in conjunction with stanchions and either rope, cable or chain.

If an employee must work within a control zone an alternative form of fall protection, such as travel restraint equipment, pre-engineered portable guardrails or a permanent guardrail shall be used.

Factors such as weather, the work being performed, materials that are being handled, mechanical equipment required to perform the work and the experience of the employees involved in the job may require that warning lines are set back more than 2.0 meters from the edge

10. Wooden Guardrails and Portable Pre-Fabricated Guardrail Systems

The use of guardrails should be considered whenever possible because of their ability to protect all employees and other persons especially those with little or no fall protection training. Additionally these systems require very little care or maintenance.

Wooden Guardrails

If a piece of equipment, that is worked on frequently, is located within 2.0 meters of a control zone (4.0 meters of the unprotected edge of a building) wooden guardrails can be installed to provide protection from the unprotected edge. Wooden guardrails can be erected as part of a wooden platform or by using adequately constructed bases.

If the access route to a work area is within 2.0 meters or less of the control zone the installation of a wooden catwalk with guardrails will help to ensure safe access to the work area.

Portable Pre-Fabricated Guardrail Systems

An alternative to wooden guardrails is the use of portable pre-fabricated guardrail systems. As with wooden guardrails these systems act as a barrier

that prevents employees from falling to lower levels by eliminating the fall hazard.

The unlimited number of configurations that are possible with these highly versatile and flexible systems makes them a particularly useful system for ensuring employee safety.

Any guardrails that are installed must meet the requirements of Clause 5.12, Guardrails, of CSA Z797-09 Code of Practice for Access Scaffolds.

11. Travel Restraint Systems

If a guardrail system is not in place, employees working in a control zone must use a **travel restraint system** to ensure they cannot get to the unguarded edge.

The following are anchors (as recommended by Hercules SLR) designated for use with travel restraint systems:

- Engineered anchors with a 2:1 safety factor.
- Pre-engineered 5000 rated anchor
- Pre-engineered weighted anchor systems

All travel restraint systems, including anchors, must meet the requirements of CSA standard Z259.16-04 Design of Active Fall Protection. If there is any question / concern about pre-engineered anchors or points being considered as anchors Facilities Management engineering staff must be consulted.

Self-retracting lanyards shall not be used in travel-restraint systems unless the length of the lifeline on the drum of the SRL will not permit the worker to reach the hazard (edge of the roof) even when fully deployed.

Safe job procedures must be developed for any job or activity performed inside the control zone. If a safe job procedure, appropriate for the work that will be performed, does not exist one must be developed prior to any work being performed.

12. Working At A Safe / Significant Distance From an Unguarded Edge

Many employees perform work on flat roofs at locations well away from any unprotected edge where a fall hazard exists. Unless there is a need to enter or leave such work areas at a point near an unguarded edge, employee safety is not risk. In such situations there is no need for a control zone or the

implementation of fall protection requirements that would normally apply when employees are working near an unprotected roof edge.

13. Roofs With Parapets

If a building at Dalhousie University has a flat roof and there is a parapet around the edge of the roof the top of the parapet should be at a height of height of 1.0 m (39 in.) above the roof level to provide adequate fall protection.

If the parapet does not meet the above height requirement a railing extension can be considered to permanently extend the parapet height, or, one of the required forms of fall protection must be used.

14. Access to Roofs

Flat roofs are accessed via doorways in mechanical rooms, up stairways to a door that provides access to the roof, through a hatch way set in the roof, up a ladder on the side of the building, etc. Regardless of the method of access and egress, getting on to a roof can involve certain hazards and considerable risk.

If a ladder is used to access a flat roof it should be permanently mounted to the side of the building, have side rails that extend at least 1.0 m (3.0 ft) above the landing area on the roof and have appropriate safety cage attached to the ladder with a walk through at the landing / roof level.

Landings with steps should be built inside and outside of doorways where there is a larger than normal step up or down in order to cross the doors threshold.

An approved warning sign must be posted on the inside of any door, hatch or similar type of roof access to alert employees to the existence of the fact a fall hazard exists.

Any person going out on a roof must read and sign the safe work instructions for accessing and working on the flat roofs. A copy of these procedures is to be posted at each point of access to the roof.

15. Preventing Materials From Falling

If materials, tools, equipment or other items used while working are thrown from or fall from a roof they can cause serious injury to people on the ground

or serious damage property. The following steps are to taken when ever necessary in order to minimize the risk associated with materials, tools, etc falling from a roof:

- Never throw anything off a roof.
- Use enclosed rubbish chutes, or lower materials, etc. to the ground.
- Use nets, toe boards, barriers, etc. to prevent material from falling off a roof.
- Keep the work area tidy and do not allow materials to accumulate especially near and unguarded roof edge.
- Materials, etc. on the roof must be stored in safe locations well away from the roof edge and control zone. Extra precautions should be taken in windy conditions.
- Prevent access to danger areas underneath where roof work is being done.
- If necessary use debris netting, covered walkways or similar safeguards to stop falling material from causing injury or damage.
- Use mechanical handling / lifting devices to raise heavy items up to a roof and reduce the risks associated with manual handling.

16. Additional Issues

Other Safety Programs

If procedures such as lockout or hot work permits are required they must be integrated into the procedures developed for working on the flat roof where such work will be performed.

Travel Restraint System Components

All components used as part of a fall arrest system must meet the requirements and specifications of CSA standard CSA Z259.16, “Design of active fall-protection systems”.

Fire Alarms

While working on a roof it may not be possible to hear a fire alarm due to the employees distance from a fire alarm bell, the noise of equipment on the roof,

or other issues. When such conditions exist alternate safety measures must be developed to ensure any employee(s) working on the roof are alerted to the existence of a fire hazard.