

A Safe Workplace

A Workplace Safety and Health Manual for Your Community

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Subject: G-12	Fall Protection	Effective: April 01, 2005
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Refer to *The Manitoba Workplace Safety and Health Act and Regulations*, Fall Protection and MB WSH Fall Protection Guideline.

Council must ensure that an employee is protected from falling:

- a vertical distance of 3 metres (9.8 ft.) or more;
- a vertical distance of less than 3 meters where there is an increased risk of injury due to the surface or item in which the worker might land;
- into operating machinery or moving parts of the machinery;
- into water or another liquid;
- into or onto a hazardous substance or object;
- through an opening on a work surface; or
- a vertical distance or more than 1.2 meters from an area used as a path for a wheelbarrow or similar equipment;
- into water from a boat or platform.

A protection system must be implemented to control the hazards to employees. The system selected depends on the circumstances related to the job. Ideally, the choice of a protection system will be one that removes the risk of falling entirely. For example, it is preferable that a fixed barrier is provided to prevent an employee from falling. The second line of defense is personal protective equipment (a safety harness and lifeline).

Fall protection systems can include:

- surface protection (non-slip flooring);
- fixed barriers (handrails, guardrails);
- surface opening protection (removable covers, guardrails);
- travel restraint systems (safety line and belt);
- fall arrest systems (safety line and harness);
- fall containment systems (safety nets);
- a life jacket including the following rescue equipment:
 - an appropriate boat equipped with a boat hook, a buoyancy device with no less than 15m of 9mm diameter nylon rope and a signaling device; and
- a full body suit that protects the worker from hypothermia and buoyancy equipment that meets CSA standards, when working on ice where water below is more than 1 metre deep.

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Surface Protection Systems

Housekeeping

In order to prevent slips and falls work surface must be kept free from tripping and slipping hazards. This can be accomplished by ensuring that good housekeeping practices are instituted at the workplace. It is important to keep the work area free of equipment and materials that are not required for the task at hand.

Slipping and Tripping Hazards

Examine the site for slippery or uneven surfaces. Ensure that floors, platforms, walkways, ramps and stairs are maintained in a state of good repair and kept free of slipping and tripping hazards. When a hazard is present prevent the area from being entered and post a sign indicating "no entry"

Non-slip floors

Floors that become slippery due to the work operations should be protected with a non-slip type surface or coating that will ensure a secure walking surface. Footwear with special soles may be also required. Material spills must be cleaned up immediately, especially if it creates a slippery surface.

Fixed Barrier Protection Systems

A fixed barrier must be capable of stopping an employee from proceeding past the edge of a work level or into a floor opening. Barriers may be permanent or temporary, depending on the circumstances at the workplace. Types of barriers include: guardrails, handrails, ladders, cages, fencing, warning barriers.

Guardrail

A guardrail is a permanent or portable structural system consisting of a top rail, mid-rail and toe board secured to vertical posts intended to stop an employee from inadvertently stepping off a working level and falling to a level below.

Guard railing consists of a top rail at a height of between 900mm and 1060mm (36 to 42 inches) above the working surface with an intermediate rail midway between the top rail and bottom level. The guard railing must be of capable of resisting a static load of 900 Newton's (200 pound force) at any point along the rails.

When guard railing is constructed of wood, all members shall be free from splinters and

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protruding nails and at least nominal 50 by 100mm (2" by 4") with a span of no more than 2.4 metres (8') between posts. Where there is a danger of materials or objects falling from the work surface to a working level below, a toeboard 125 mm (5 inches) in height is required to be secured to the guardrail posts. Guardrail posts must be capable of supporting any loads applied to the top rail. They must be securely attached to the base and braced where necessary to remain solid and secure. Posts are not to exceed a maximum spacing of 2.4 metres (8 feet) apart. There are many different variations of guardrails, including wood-slat, wire rope, steel frame, safety fencing, tube and clamp, perimeter netting and others. Any of these variations is acceptable, as long as the system meets the basic design characteristics as mentioned previously. For example, where wire rope (cable) is used for guard railing, it must be tensioned to provide equivalent strength protection as a wooden guardrail system with a top and intermediate rail.

When the use of a guardrail system is not reasonably practicable or would not be effective, an employer must ensure that the worker is protected by at least one of the following fall protection systems:

- a travel restraint system;
- a fall arrest system;
- a safety net; or
- another fall protection system approved by the director.

Warning Barrier Protection Systems

A warning barrier is used to indicate to employees that they are approaching a hazardous work area, where a potential to falling exists. The warning barrier is used where it is not reasonably practicable to provide fixed barrier protection, or a guardrail has been temporarily removed from an area. This system may utilize a cable, rope, or a fence system which is set up at least 2 metres from the work surface opening or edge. The effectiveness of this type of system is increased when high visibility flagging or other means is used to mark the warning barrier.

A warning system is not a substitute for guard railing as it is usually of lesser strength and offers no protection to the employee who must go near the edge of a work area. Employees who are required to go beyond the warning barrier must use a travel restraint or fall arrest system. Lifelines must not be tied to the warning system or barricade.

Handrail Protection Systems

On the open side of stairs, ramps and other similar means of access, proper handrails must be provided. These serve as both a physical barrier and a means of support to an employee moving up and down the accessway.

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Handrails should be designed the same as a guardrail, with a top rail, intermediate rail and a toe board where employees may be working below.

Surface Opening Protection System

Guardrails/floor coverings

Surface openings in floors and other walking surfaces where employees have access, must be protected by guard railing or secured wood or metal covers. The covering must be capable of supporting all loads to which it may be subjected. The covering must be identified to indicate that there is an opening below.

When plywood is used to cover openings, the minimum thickness shall be 19mm (3/4") with proper support for the plywood.

If work must be undertaken near unprotected openings from which an employee could fall 3 metres or more, access must be restricted to employees who are wearing full body safety harnesses and lifelines secured to proper anchorage. As soon as the necessary work is completed, the opening should be protected by guard railing or adequate covering.

If a fixed barrier or surface cover is removed for any reason, proper travel restraint or fall arrest systems must be provided for any employee who becomes at risk of falling.

Travel Restraint Protection Systems

Travel restraint system

A travel restraint system is intended to limit an employee's movement so the employee is unable to reach a location where there is a risk of falling.

The restraint system is made up of a safety harness, lifeline and/or lanyard and anchor. The safety harness is secured to a lifeline having a fixed length which is attached to a secure anchor. The length of the lifeline is such that the employee can only proceed to within approximately 1 metre of an opening or edge.

Under no circumstances should a travel restraint system be rigged so that an employee is in a position to fall.

Despite the reference to safety belts in CSA Standard Z259.1-05, Body Belts and Saddles for Work Positioning and Travel Restraint, an employer must ensure that a safety belt is not used as part of a fall protection system in the workplace.

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Seat Belts

A seat belt may be considered a "travel restraint system", as it serves as a device to limit movement when a force is applied to the user. The use of seat belts most often applies to operating motor vehicles and mobile equipment. The seat belt prevents the operator or passenger from falling out of the protective compartment of the equipment. This is much safer than being thrown out of the equipment onto a surface or object.

All mobile equipment that is equipped with a roll over protection system must have seat belts installed. Any employee operating equipment must wear the seat belt at all times when the vehicle is in operation.

Fall Arrest Protection Systems

A fall arrest system differs from a travel restraint system. Unlike travel restraint, a fall arrest system does not prevent a fall, it reduces the chance of injury when a fall takes place.

All fall arrest equipment must meet CSA Standards.

A complete fall arrest system consists of an anchorage point, lifeline, fall arrester, lanyard, shock absorber, and full body safety harness. A 100 kg (220 lbs.) employee free falling 1.0 metres (3 ft.) generates an impact force of approximately 12kN (2700 lbs.).

1. **Anchorage point** - the anchorage must be capable of supporting a static load of 22.2kN (5000 lbs.) in any direction, with proper provision to accept a lifeline connection. If the anchor is exposed to the elements, it must be corrosion resistant. (The minimum thickness of an eyebolt type anchor is 19mm (3/4") with a 38mm (1 1/2") opening diameter.)
2. **Lifeline** - this is the part of the system that is attached to the anchor point and the user of the system. Lifelines must have a minimum strength equivalent to 60mm (5/8 inch) diameter polypropylene fibre rope. Lifelines must be properly secured to the anchorage point and be protected from abrasion or damage along their full length. Lifelines may run vertically or horizontally (installed between two or more anchors), depending on the application. Horizontal systems must be engineered properly, due to the loading applied to the anchors. Temporary lifelines are made of wire or synthetic rope. Permanent systems may be made of rigid steel or aluminum rails, wire ropes, or similar materials. (Reference latest edition of CSA Z259.2.1-98 (R2004) "Fall Arresters, Vertical Lifelines and Rails.")
3. **Fall arrester (rope grab)** - this is a device that automatically locks onto the lifeline when a fall occurs. It is fitted between the lifeline and lanyard and normally slides freely on the lifeline until there is a sudden downward motion. When this sudden motion occurs, the fall

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arrester "grabs" the lifeline and holds firmly. Fall arresting mechanisms are also built into retractable lifeline devices, that play out and retract as necessary, but hold fast in the event of a fall, (similar to a seat belt in an automobile).

4. **Lanyard** - a lanyard is an approved device located between the fall arrester and the employee's safety harness. Lanyards should conform to CSA Z259.11-05 "Energy Absorbers and Lanyards".
5. **Shock absorber** - this is a device that limits the force applied to the user when a fall occurs. It is designed to absorb the kinetic energy of the fall as the employee is stopped. The shock absorber prevents both injury to the employee and the amount of energy transferred to the lifeline and anchor. A shock absorber may be a separate device or built into the lanyard design. Lanyards should conform to the latest edition of CSA Z259.11-05 "Energy Absorbers and Lanyards".
6. **Full body safety harness** - this is a device designed to contain the torso and pelvic area of an employee and to support the employee during and after a fall. A full-body safety harness with adequate attachment points conforming to Canadian Standards Association CSA-Z259.10-06 "Full Body Harnesses" is the type to be used for a fall arrest system.

Lifelines may be of the fixed length type, adjustable with rope grab or self adjusting (retractable) type. Shock absorbing mechanisms are available either incorporated into the lanyard or as an add-on and must be used to lessen the shock to the employee.

NOTE: A fall arrest system must be manufactured so that a worker's free fall distance does not exceed 1.2 metres (3.9 feet) excluding the increase in the total fall distance resulting from the use of shock absorbers.

Inspection and Maintenance

Council must ensure that the equipment used as part of fall protection system is:

- inspected prior to use by the competent person using the system;
- kept free from any substance or condition that could contribute to deterioration of the equipment;
- maintained in good working order as per manufacturer's recommendations;
- removed from service after it has arrested the fall of a worker; and
- Removed from service for repairs or destruction if defective or damaged.

Council must also ensure that employees using a fall protection system is trained in its use, care and inspected by a competent person.

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Fixed Ladder Protection Systems

Vertical fixed ladders should be provided with a means to protect an employee from falling. This may consist of a ladder cage or a fall arrest system. A ladder cage is a permanent structure attached to a ladder that provides a barrier between the employee and the surrounding space. It serves only as a support to an employee, if the employee needs to rest against the barrier. It does not provide complete fall protection on its own. However, it could be used in conjunction with a full body harness and lanyard. The employee would be able secure to the rung or side rail of the ladder at any time during the climbing of the ladder. This still does not provide complete fall protection.

A much better approach is to provide a complete fall arrest system into the ladder design. This could be a permanently installed metal rail or wire rope anchoring system with an automatic fall arresting device. The automatic fall arresting device would travel freely on the rail or cable, allowing the employee to use both hands while climbing up or down. Should the employee slip or fall, the device would lock instantly and limit the employee's fall to a matter of inches.

Another possibility is to mount a retractable fall arresting device to a fixed anchor at the top of the ladder. The employee would then be equipped with a full body safety harness secured to the end of the retractable lifeline. The employee would be in a position to move up and down the ladder, at all times protected.

Community Responsibilities

Council must ensure that:

- All required employees are provided with initial and refresher fall protection training prior to working at heights
- employees are adequately protected against falling; and
- that the equipment used as part of the fall protection system is maintained, inspected and stored
- in good working order and in accordance with the manufacturers specifications.

Note additional information can be found on the safemanitoba.com website in the Fall Protection Guideline.