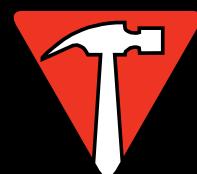


GUIDE

# Fall Protection Guide



**SAFE  
WORK**  
MANITOBA™

This guide provides practical help in developing and maintaining safe systems of work, including safe work procedures for workers working at elevated levels.

## **Acknowledgements**

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# GUIDE

# Fall Protection

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# INTRODUCTION

Falls account for a number of lost time injuries and fatalities at Manitoba workplaces.

## Categories of Falls:

- Fall to work surface (ex. slips)
- Fall against / onto an object
- Fall from moving vehicle/equipment
- Fall from stairs, ramps and ladders
- Fall from one work level to the other
- Fall from edge of work level
- Fall into/through an opening

## Workplace Safety and Health Regulation Requirements

The Workplace Safety and Health Act and Part 14 of the Manitoba Workplace Safety and Health Regulation (M.R. 217/2006) require specific actions to be taken to protect workers at risk of falling.

Note: additional requirements for residential construction can be found in Part 31 of M.R. 217/2006.

This guide provides practical help in developing and maintaining safe systems of work, including safe work procedures, for workers working at elevated levels.

## Reference Standards

- CAN/CSA Standard Z91– Health and Safety Code for Suspended Equipment Operation
- CAN/CSA Standard Z271 – Safety Code for Suspended Elevating Platforms
- CAN/CSA Standard Z259.1 - Body Belts and Saddles for Work Positioning and Travel Restraint
- CAN/CSA Standard Z259.2.1 - Fall Arrestors, Vertical Lifelines and Rails
- CAN/CSA Standard Z259.2.2 - Self-Retracting Devices for Personal Fall Arrest Systems
- CAN/CSA Standard Z259.2.3 - Descent Control Devices
- CAN/CSA Standard Z259.10 - Full Body Harnesses
- CAN/CSA Standard Z259.11 - Energy Absorbers and Lanyards
- CAN/CSA Standard Z59.12- Connecting Components for Personal Fall Arrest Systems
- CAN/CSA Standard Z259.16- Design of Active Fall Protection System
- CAN/CSA Standard Z259.13- Flexible Horizontal Lifeline System
- ANSI 14.3 - Safety Requirements for Fixed Ladders, American National Standard for Ladders – Fixed – Safety Requirement
- ANSI Standard 10.11 - Safety Requirements for Personnel and Debris Nets
- American National Standard for Construction and Demolition Operations
- CSA Standards regarding ladders are listed under that specific section of this guide

## Note:

The Workplace Safety and Health Division has prepared Standards Information Sheets to summarize the general requirements of these noted Standards. Users are encouraged to obtain full copies of a referenced Standard.

Metric units of measurement in this guide are provided according to the International System of Units.

If a value for measurement provided in this guide is followed by an equivalent value in other units, the first value provided is to be considered as the requirement. The equivalent value (in parenthesis) may be approximate.

# RISK EVALUATION

When assessing the workplace for fall hazards, it is important to conduct a complete risk evaluation. This evaluation can be done in the form of a job hazard analysis, where the work task is broken down into individual steps that are then analyzed to determine the hazards. Once the hazards have been identified, control measures and safe work procedures are developed and put in place to prevent falls at the workplace. For more information on conducting job hazard analysis and developing safe work procedures please see SAFE Work Manitoba Bulletin 249, Parts 1 and 2.

## SAFE WORK PROCEDURES

Employers must develop and implement safe work procedures to protect workers from falls at the workplace before beginning work on a project.

**Part 14 of Manitoba's Workplace Safety and Health Regulation (M.R. 217/2006) requires:**

**Safe work procedures:**

**14.1(1)** This Part applies to every workplace where there is a risk of a worker falling

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

**14.2(1)** An employer **must**

- (a) develop and implement safe work procedures to prevent falls at the workplace;
- (b) train workers in the safe work procedures; and
- (c) ensure that workers comply with the safe work procedures.

**14.2(2)** The safe work procedures must identify the fall hazards at the workplace and set out the measures that will be used to prevent falls at the workplace.

**14.2(3)** When this Part requires the use of a guardrail system or fall protection system at a workplace, the safe work procedures must address the following issues:

- (a) the location of each guardrail system or fall protection system to be used at the workplace;
- (b) the procedures used to assemble, maintain, inspect, use and disassemble a fall protection system;
- (c) where applicable, the rescue procedure to be used for rescuing a worker after a fall has been arrested.

The safe work procedures include:

- responsibilities of supervisors and workers on the project
- fall protection methods to be used
- personal protective equipment to be used



# CONTROL MEASURES

## Fall Protection Systems

The following systems provide effective fall protection for workers when properly designed, constructed and used:

- Surface protection (non-slip flooring)
- Fixed barriers (handrails, guardrails)
- Surface opening protection (removable covers, guardrails)
- Warning barriers/control zones (flat roofs / decks only)
- Travel restraint systems (lifeline and full body safety harness)
- Fall arrest systems (lifeline, shock absorber, and full body safety harness)
- Fall containment systems (safety nets)

When selecting a fall protection system, consider the circumstances and the job.

The ideal choice of fall protection for workers is one that removes the risk of falling entirely. For example, it is preferable to provide a fixed barrier to prevent a worker from access to an area that presents a risk of falling, than providing the worker with personal protective equipment (safety harness, shock absorbers, and lifeline) to protect them in the event of a fall.

## SURFACE PROTECTION

### Housekeeping

It is important to maintain good housekeeping practices at the workplace. This includes keeping the work area free of equipment and materials that are not required for the task at hand, and keeping the work surface free from trip or slip hazards.

### Slippery Work Surfaces

If work surfaces become slippery because of work activities (ex. water, oil, grease) or environmental factors (ex. snow, ice), employers must ensure that workers are provided with a secure walking surface. Material spills must be cleaned up immediately, and in some cases, footwear with special soles may be required.

## FIXED BARRIERS

A fixed barrier must be capable of stopping a worker 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. Fixed barrier types include: guardrails, handrails, ladder cages, fencing, and warning barriers.

### Guardrails

A guardrail is a permanent or portable structural system intended to stop a worker from unintentionally stepping off a working level and falling to a level below.





Guardrailing consists of a top rail at a height of between 900mm and 1060mm (36 to 42 in) above the working surface, and a mid-rail at a height between 450mm and 530mm (18 to 22 in) above the working surface.

The guardrailing must be constructed and secured to resist a static load of 900 Newton's (200 lb force) applied in any direction at any point on the top rail and any intermediate rail.

If guardrailing is constructed of wood, it must be free from splinters and protruding nails and have a top and mid-rail of at least 38mm by 89mm (1 1/2 by 3 1/2 in) securely supported on posts no less than 38mm by 89 mm (1 1/2 by 3 1/2 in), and spaced no more that 2.4 m (8 ft) apart.

If there is a danger of materials or objects falling from the work surface to a working level below, a guardrail must have a toe board securely fastened to the posts, extending from the surface of the working area to a height of at least 125 mm (5 in).

Guardrail designs include:

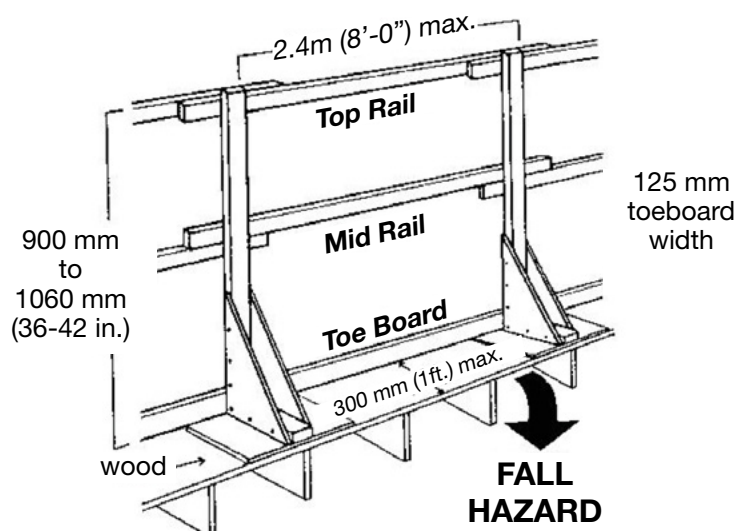
- wood-slat,
- wire rope (with highly visible identifiers),
- steel frame,
- safety fencing,
- tube and clamp,
- perimeter netting and others.

Any of these is acceptable, as long as the system meets the basic design characteristics already mentioned.

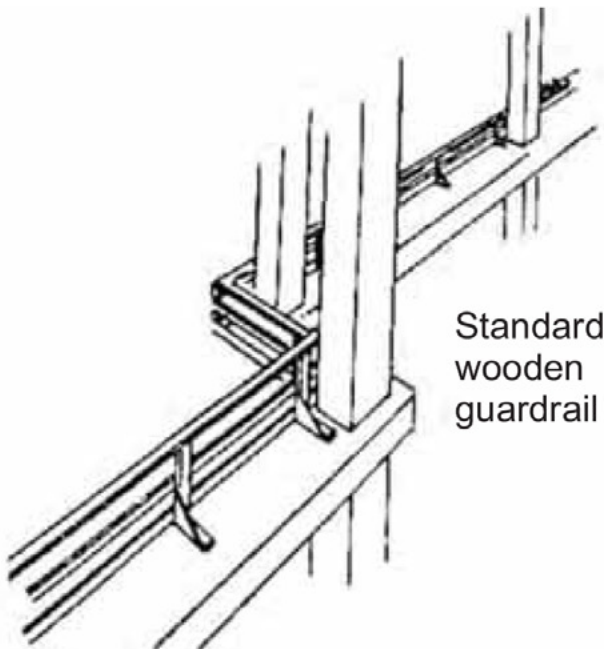
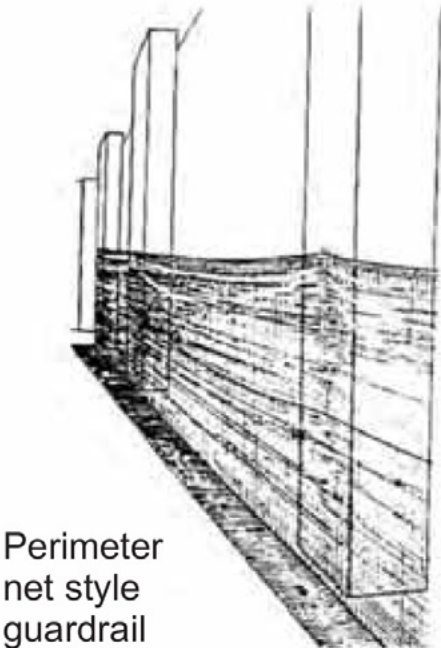
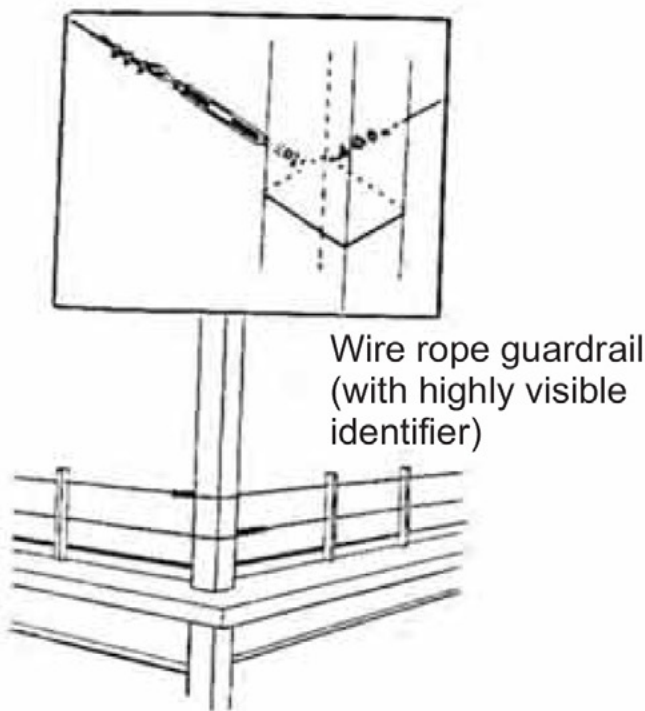
For example, where wire rope (cable) is used for a guardrail, it must be tensioned to provide the same strength protection as a wooden guardrail system with a top and intermediate (middle) rail.

Prior to and during the installation of a guardrail, it is essential that a full body safety harness and an independent lifeline, properly secured to an adequate fixed anchor, is used by every worker who may go near an open edge and be at risk of falling a distance of 3 m (10 ft) or more.

**Note:** If a guardrail system will be provided at a workplace, employers must ensure that the guardrail system will not exceed the loading conditions specified under the Manitoba Building Code for the surface that it is installed on.

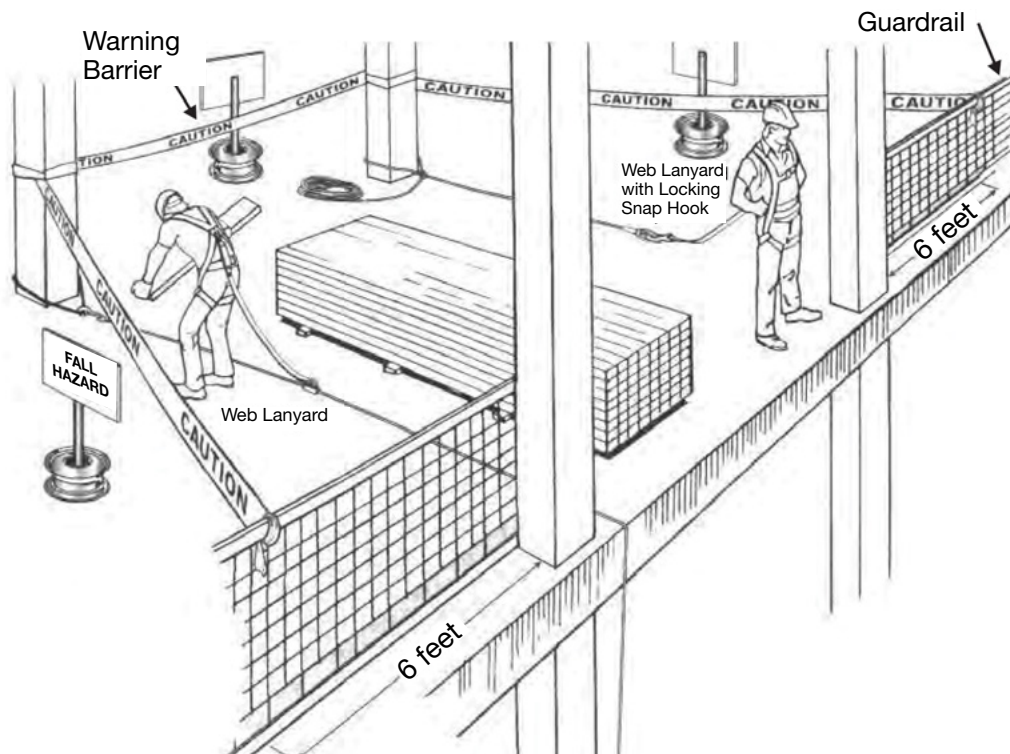


**Examples of Guardrails:**



## Temporary Removal of Guardrails

Employers may temporarily remove a guardrail when it is necessary for work to be completed in the immediate area. Employers must ensure that workers in the area use a fall protection system while the guardrail is removed. If a guardrail is temporarily removed, warning signs or warning tape should be used to mark off the hazard area.



A warning barrier / control zone alerts workers that they are approaching a hazardous work area, where a potential fall hazard exists. The warning barrier / control zone is to be used when it is not practical to provide fixed barrier protection, or when a guardrail has been temporarily removed.

This warning system may consist of a cable, rope, or fencing system set up at least 1.8 m (6 ft) from the work surface opening or edge. A high visibility identifier should be used to mark the warning barrier.

A warning system / control zone is not a substitute for guardrailing as it offers no protection to the worker who must go near the edge of a work area. Workers 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.

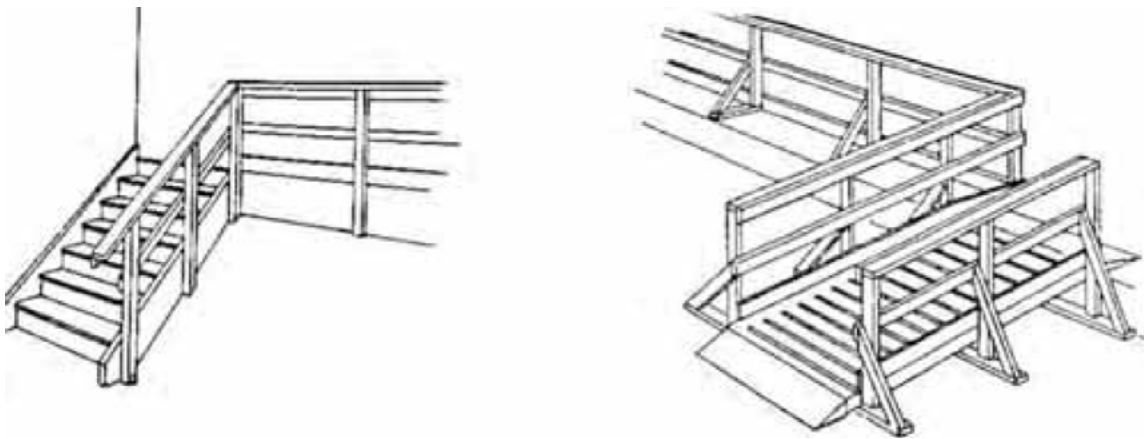


# TEMPORARY HANDRAILS

Proper handrails must be provided on the open side of stairs, ramps and other similar means of access,. These serve as both a physical barrier and a means of support for workers moving up and down the access way. Handrails should be designed the same as guardrails, with a top rail, intermediate (middle) rail and a toe board, if workers are working below.

**Note:** If a permanent handrail system will be provided at a workplace, employers must ensure that the handrail system complies with the requirements specified under the Manitoba Building Code.

## *Examples of handrails*



## Surface Opening Protection

### *Guardrails/ floor coverings*

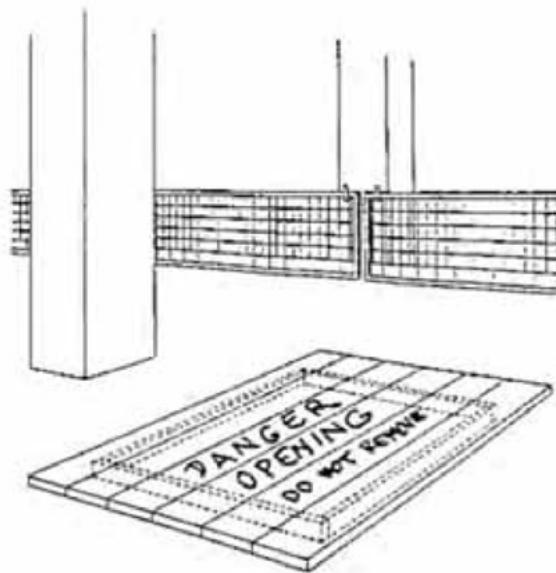
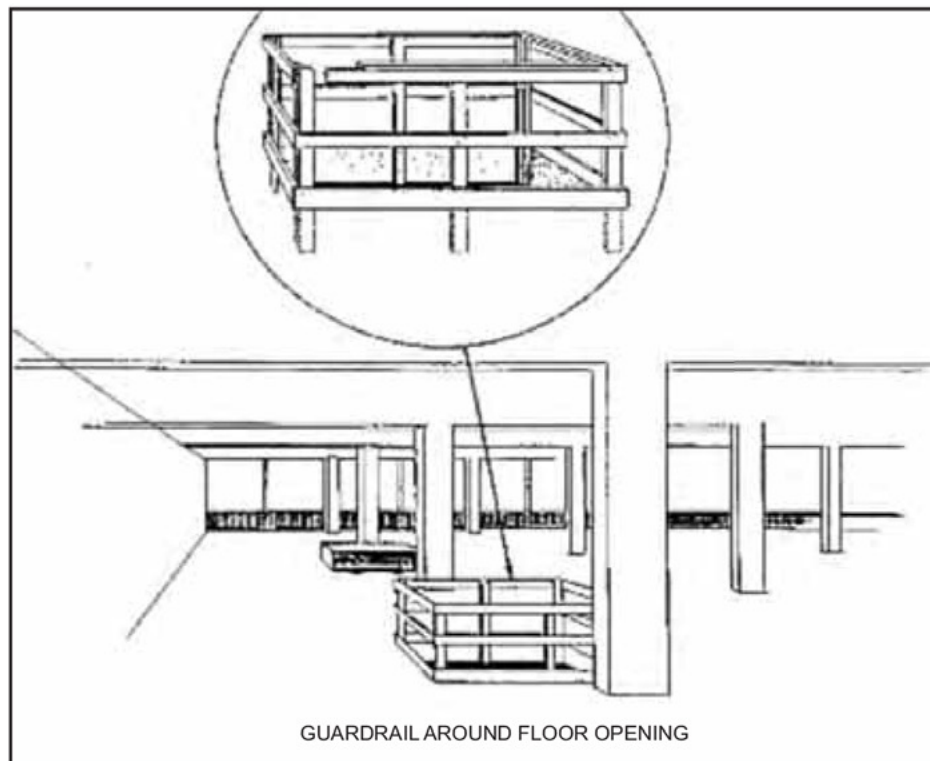
Surface openings in floors and other walking surfaces accessible by workers must be protected by guardrailing, secured wood or metal covers. If wood or metal covers are used, they must be capable of supporting all loads that may be placed on them. The covering must also identify that there is an opening below (refer to Part 30 of the workplace safety and health regulation).

If plywood is used to cover openings, it must be a minimum thickness of 19mm (3/4 in) with proper support for the plywood.

If work must be done near unprotected openings that present a fall hazard of 3 m (10 ft) or more, access to this area must be restricted to workers wearing full body safety harnesses and lifelines secured to proper anchor. Once the work is complete, the opening must be protected by guardrailing or adequate covering.

**REMEMBER:** If a fixed barrier or surface cover is removed for any reason, proper travel restraint or fall protection must be provided for any worker who must work near the unprotected opening.

## Example of Surface Opening Protection:



# TRAVEL RESTRAINT SYSTEMS

Example of a travel restraint system:

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

Travel restraint systems prevent workers from traveling to the edge of an opening.

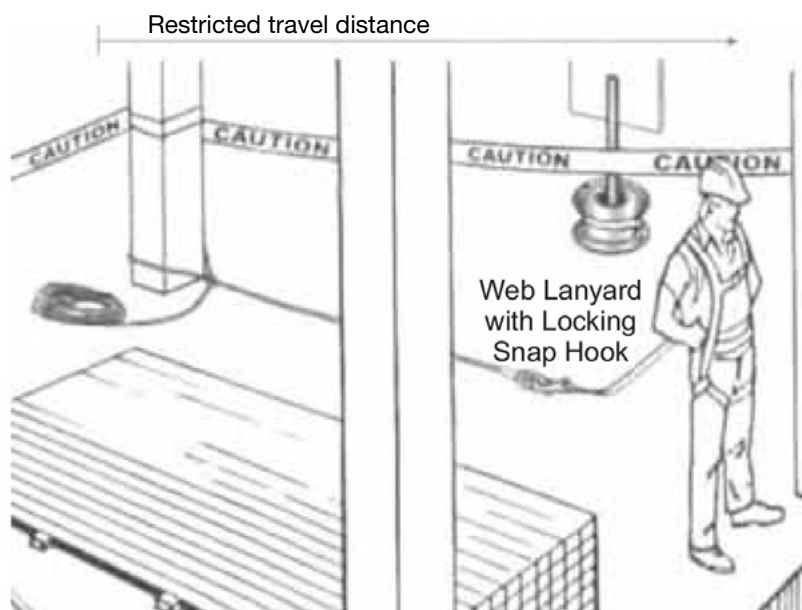
When choosing a fall protection system, first consider installing guardrails or barriers. They provide a high degree of protection when installed properly.

However, if it is not practical to install guardrails or barriers at a work site, personal fall protection equipment may be necessary.

Note: The regulation does not require the use of fall protection systems at fall heights less than 3m (10ft) unless there is an increased risk of worker injury due to the surface or item on which the worker might land, or there is a risk of a worker falling:

- 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 of more than 1.2 m (4 ft) from an area used as a path for a wheelbarrow or similar equipment.

The Manitoba Workplace Safety and Health Regulation (M.R. 217/2006) states: "Despite the reference to safety (body) belts in CAN/CSA Standard Z259.1 Body Belts and Saddles for Work Positioning and Travel Restraint, an employer must ensure that a safety (body) belt is not used as part of a fall protection system at the workplace."





The restraint system consists of a full body safety harness, lifeline and/or lanyard and adequate attachment points.

The full body safety harness is attached to a lifeline, having a fixed length, which is attached to a fixed support meeting the requirements of section 14.14 of M.R. 217/2006.

The length of the lifeline or the lanyard is selected so that the worker can only proceed to within 1 metre (3 ft.) of an opening or edge.

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

## FALL ARREST SYSTEMS

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

A complete fall arrest system consists of adequate attachments points, lifeline, fall arrestor, lanyard, shock absorber, and full body safety harness.

A 100 kg (220 lbs) worker free falling 1m (3 ft) generates an impact force of approximately 12 kN (2,700 lbs).

See Specifications for Fall Arrest Systems in the next section.

Pre-engineered (pre-manufactured) fall protection systems that suppliers may provide as kits, have to be installed, used and maintained according to manufacturer specifications. These temporary fall protection systems can be installed in different locations.

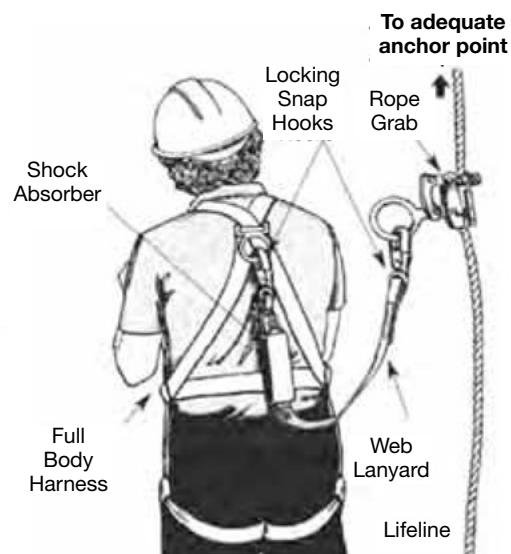
Permanent, site specific fall protection systems designed by a professional engineer, are specific to a certain location.

Both systems include the following components:

1. **Full body safety harness** - a device consisting of connected straps, designed to contain the torso and pelvic area of a worker, with an area to attach a lanyard, lifeline or other component, used to support the worker during and after a fall. A Grade 'A' full-body safety harness conforming to Canadian Standards Association CSA-Z259.10 "Full Body Harnesses" must be used for a fall arrest system.

Full body harnesses have four main functions:

- (a) to securely hold the worker's body during free fall, deceleration and final arrest
- (b) to distribute arrest forces to those parts of the body able to absorb the forces without significant injury. Full body harnesses with straps that pass across the buttocks are particularly good at doing this;
- (c) to keep the body in an upright or near upright position after the fall and until the worker is rescued; and
- (d) to allow workers to do their work without restricting their movement.



CSA Standard Z259.10 lists five classes of full body harness according to their intended use:

**Class A** harnesses shall have one D-ring for fall arrest attachment affixed to both shoulder straps at the back. Note: It is recommended that Group A harnesses be provided with a sub-pelvic strap and a sliding D-ring for fall arrest attachment.

**Class D** harnesses shall have front or side-mounted D-rings, but they shall not be mounted at waist level.

**Class E** harnesses shall have a sliding D-ring on each shoulder strap.

**Class L** harnesses shall have one (1) or two (2) D-rings attached to the front of the harness.

**Class P** harnesses shall have D-rings mounted at waist level.

Regardless of which group the harness belongs to, every harness must be able to arrest a fall and therefore meet the requirements of Group A harnesses. A full body harness designed to arrest falls has:

- (a) a back mounted D-ring located between the shoulder blades;
- (b) the letter “A” stenciled on each shoulder strap below the D-ring; and
- (c) an arrow stenciled above each letter “A” pointing up at the D-ring. The arrows on the shoulder straps point to the only D-ring on the harness designed to safely arrest a fall.

#### Example of a Full Body Harness:

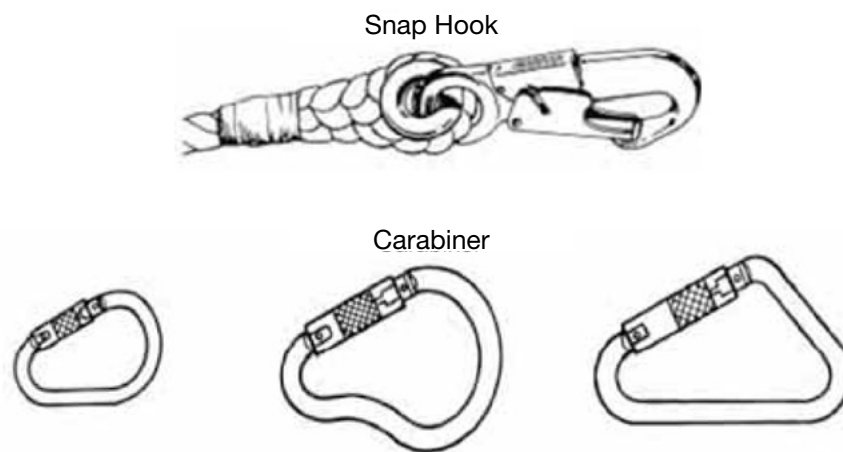




- 2. Carabiners, D-rings, O-rings, Self-locking Connectors and Snap hooks** – Carabiners, D-rings, O-rings, oval rings, self-locking connectors and snap hooks that are used to connect the components of a personal fall arrest system are subjected to the full maximum arresting force developed during a fall. The failure of any portion of this connecting hardware can lead to the failure of the entire fall arrest system.

For compliance purposes, D-rings, O-rings, oval rings, self-locking connectors and self-locking snap hooks must meet the requirements of CSA Standard Z259.12, Connecting Components for Personal Fall Arrest Systems (PFAS).

Snap hooks are a Class I connecting component that consists of a hooked-shape body having a self-locking and self-closing feature that may be opened to permit the body to receive an object and that, when released, automatically closes and locks to prevent inadvertent opening. Snap hook connectors also have an integral closed eye, either fixed or swiveling, to be permanently fastened to a subsystem.



To comply with the CSA Standard, only snap hooks and carabiners that are self-closing and self-locking can be used as interconnecting hardware in fall arrest systems. For these connecting components to be acceptable for use, their gates require at least two consecutive, deliberate actions to open.

Snap hooks and carabiners that are not self-closing or self-locking cannot be used as connecting hardware in personal fall protection systems and must be removed from use and storage.

The introduction of this self-closing, self-locking requirement is intended to prevent “roll-out”. When a force is applied on the top of a non-locking gate, the gate opens, releasing the mating hardware. The most typical roll-outs have been known to occur between snap hooks and D-rings.



- 3. 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 worker is stopped.

Shock absorbers serve three main functions:

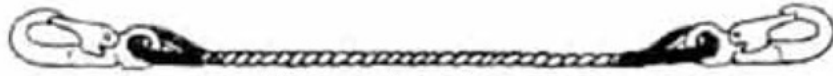
- (1) to reduce the maximum arresting force on the worker's body during arrest of the fall. A worker's fall distance is not what injures or kills the worker — the critical factor is the quantity of energy the worker's body must absorb. Since the quantity of energy the human body can safely absorb during fall arrest is limited, the fall arrest system must absorb as much of the fall energy as possible;
- (2) to lessen or prevent damage to other components of the fall arrest system; and
- (3) to lower the force acting on the fall arrest system 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 "Energy Absorbers and Lanyards ". A shock absorber approved to the CSA standard is permitted to permanently extend up to 1.2 metres (4 feet) when arresting a 100 kilogram (220 pound) mass falling freely 1.8 metres (6 feet). The maximum arresting force is limited primarily through elongation of the shock absorber. The user or designer of a fall arrest system incorporating a shock absorber must, therefore, consider the increase in the total fall distance due to extension of the shock absorber.

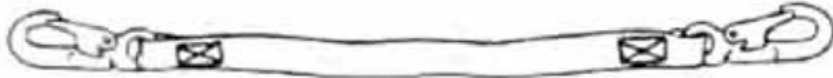
Employers must ensure that the fall arrest system does not include a shock absorber if wearing or using one could cause a worker to hit the ground or an object or level below the work.

- 4. Lanyard** - means an approved device consisting of either a flexible line of webbing, synthetic fibre or wire rope that is used to secure a full body harness to a lifeline or anchor. A lanyard is always positioned between the anchor point and the worker's safety harness. Lanyards should conform to CSA Standard Z 259.1- Body Belts and Saddles for Work Positioning and Travel Restraint

## Examples of lanyards:



Nylon rope lanyard



Synthetic web lanyard



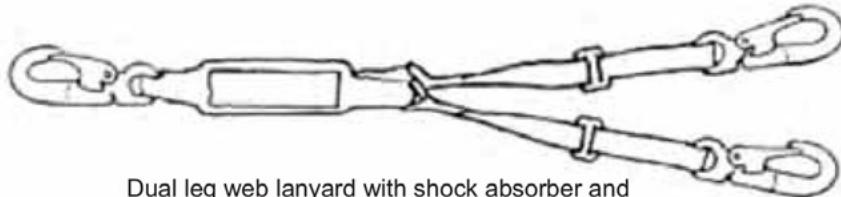
Wire rope lanyard



Adjustable length web lanyard with shock absorber



Fixed length web lanyard with shock absorber



Dual leg web lanyard with shock absorber and adjustable legs



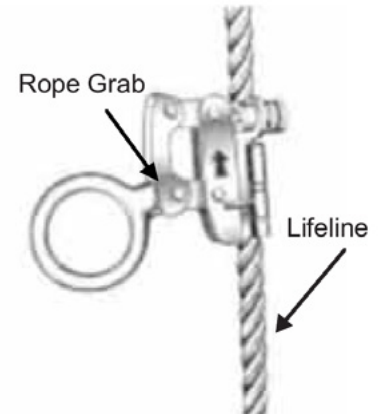
Web lanyard with shock absorber



Shock absorber lanyard



5. **Fall arrestor (rope grab)** – commonly referred to as a rope grab or cable grab, is used when workers need to move vertically, normally over substantial distances. A fall arrestor is fitted between the lifeline and lanyard and normally slides freely on a vertical rope or rail (lifeline), following the worker's movements until there is a sudden downward motion. When this sudden motion occurs, the fall arrestor "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). There are four classes of fall arrestors. Refer to the latest edition of CSA Z259.2.1 "Fall Arrestors, Vertical Lifelines and Rails" and CSA Standard Z 259.2.3 – "Descent Control Devices".



6. **Body-holding device** – a device intended to support the weight of an individual in the event of a fall. It is also designed to prevent or minimize injury to the individual resulting from the forces placed on the body during arrest of the fall and subsequent suspension. Body-holding devices may also be designed to support an individual's body weight during the use of a descent control or work- positioning device, or to function as part of a work restraint system. This will not replace the use of the full body harness in a fall arrest system, it will ease holding the person after the fall has been arrested.

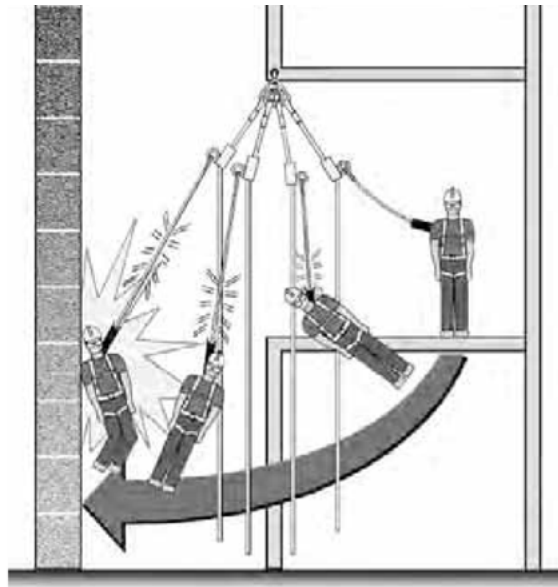
**Lifeline** – defined as a flexible synthetic line or rope made of fibre, wire or webbing, rigged from one or more anchors to which a worker's lanyard or other part of a personal fall protection system is attached. This part of the system is attached to the anchor point and the user of the system. Lifelines must have a minimum strength equivalent to 16 mm (5/8 in) diameter polypropylene fibre rope. Lifelines must be properly secured to the anchor 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, due to the loading applied to the anchors. Standards providing detail on the design requirements of vertical and horizontal lifelines include: CSA Z259.2.1 "Fall Arrestors, Vertical Lifelines and Rails", CSA Z259.16 "Design of Active Fall Protection Systems" and CSA Z259.13 Flexible Horizontal Lifeline Systems". For a summary of these standards, refer to the Workplace Safety and Health Division's Standards Information sheets; for complete details, refer to the standards themselves.

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.

7. **Anchor point** – (anchor) a secure point of attachment for a lifeline or lanyard. Parts of structures that happen to be located in the vicinity of where a worker is working are often used as anchors for travel restraint and fall arrest systems. Although their number is increasing, relatively few of these anchor points are manufactured to any technical standard. Employers must ensure that workers required to use fall protection equipment are capable of assessing an anchor's strength, stability and location.

Swing fall hazards must be considered when selecting an anchor point. Ideally, work should be performed directly below the anchor point. The further a worker is away from this ideal position, the greater the potential for the worker to swing like a pendulum into objects if the worker falls. In situations where swinging cannot be avoided, but where several equally good anchor points are available, the anchor point selected should direct the swing fall away from objects rather than into them. Where there is a choice among anchor points, the one offering the least amount of swing should be selected. See the figure below:

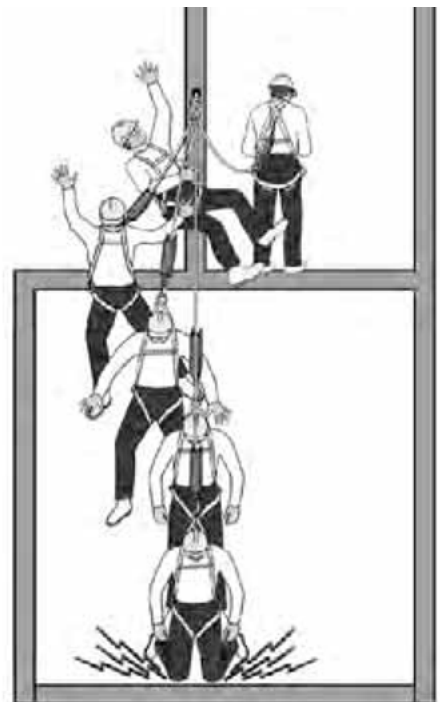
### Swing fall or pendulum effect

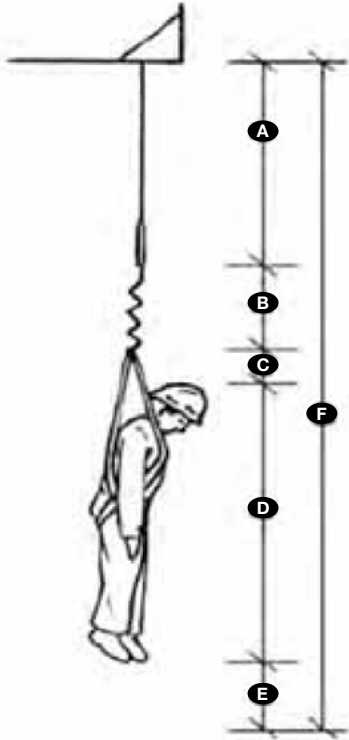


### Bottoming Out

Bottoming out occurs when a falling worker hits a lower level, the ground, or other hazard before the fall is fully arrested. This occurs when the total fall distance is greater than the distance from the work surface to the next level, the ground, or some other hazard below.

A personal fall arrest system must be planned, designed, and installed to provide sufficient clearance distance so that a worker cannot hit the ground or an object or level below the work area. Various factors must be accounted for in typical clearance calculations, including: the sag of the lifeline (if a horizontal life line is used), the length of the lanyard, shock absorber (deceleration distance), harness stretch, height of the worker, and a safety factor providing clear space between the worker and the lower surface or object.





#### Example:

A worker is 1.8m (6ft) tall using a 1.8m(6ft) long lanyard. The combined weight of the worker, clothing and tool belt is at least 100kg(200 lbs).

- A Length of lanyard – 1.8 m (6ft)
- B 1.1m (3.5 ft) deceleration (shock absorber pulling apart)
- C Harness stretch plus D-ring sliding – 0.45m (1.5 ft)
- D Height of worker – 1.8m (6ft)
- E Safety factor – 0.6-0.9 m (2-3 ft) clearance below worker's feet
- F  $A+B+C+D+E$

Overall minimum clearance is 6.0m (20ft)

## Clearance Distance

A worker's lanyard should be attached to an anchor no lower than the worker's shoulder height. If an anchor at shoulder height is not available, the lanyard should be secured to an anchor point as high as reasonably practical. Tying to an anchor at foot level is dangerous. The problem of securing a lanyard to an anchor at an appropriate height may be solved by employing one of the following anchor systems:

### Permanent anchor system

Employers must ensure that a permanent anchor system used as the fixed support in a travel restraint system or fall arrest system meets the following requirements:

- (a) the anchor has an ultimate capacity of at least 22.2 kN (5000 lbs) in any direction in which the load may be applied for each worker attached;
- (b) the anchor system is certified by a professional engineer as having the required load capacity;
- (c) where the anchor system is used in conjunction with a suspended work platform, the system is designed, constructed and used in accordance with CSA Z-91 Health and Safety Code for Suspended Equipment Operation and CSA Standard Z-271 Safety Code for Suspended Elevating Platforms

## Temporary fixed support system

If a permanent anchor system cannot be used at a workplace, employers must ensure that the temporary fixed support in a travel restraint system or fall arrest system meets the following requirements:

- (a) if a fall arrest system without a shock absorber is used, a support used in a fall arrest system must be capable of supporting a static force of at least 8 kN (1800 lbs) without exceeding the allowable unit stress for each material used in the fabrication of the anchor point;
- (b) if a shock absorber is used in a fall arrest system, the support must be capable of supporting a static force of at least 6 kN (1350 lbs) without exceeding the allowable unit stress for each material used in the fabrication of the anchor point;
- (c) a support used in a travel restraint system must be capable of supporting a static force of at least 2 kN (450 lbs) without exceeding the allowable unit stress for each material used in the fabrication of the anchor point.

If the anchor is exposed to environmental elements that might affect its performance, it must be corrosion resistant. (The minimum thickness of an eyebolt type anchor is 19mm ( $\frac{3}{4}$  in) with a 38mm (1  $\frac{1}{2}$  in) opening diameter.)

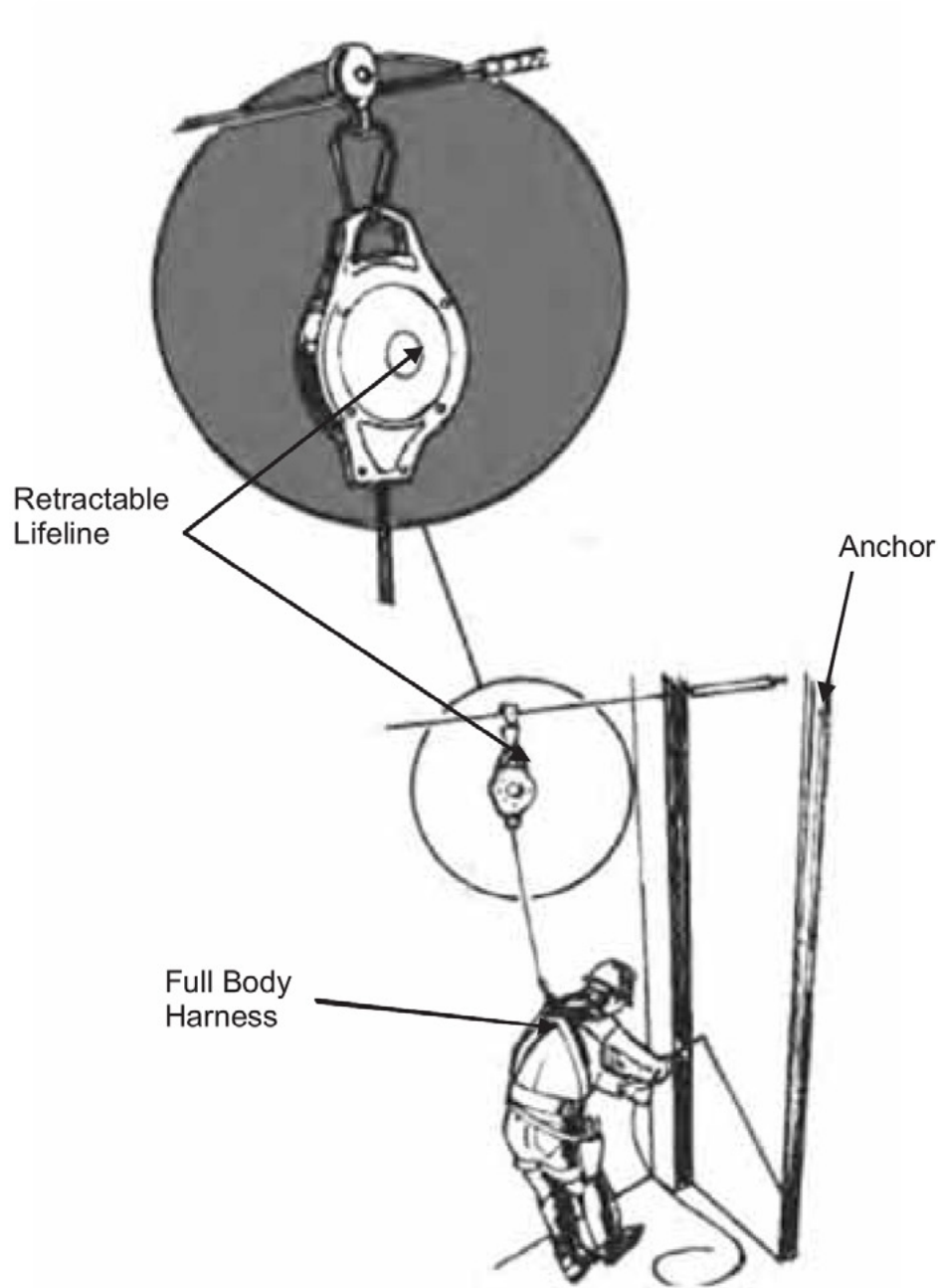
**Note:** a fall arrest system must be rigged to limit the fall of a worker to a maximum of 1.2 m (4 ft).

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.

Limit to peak dynamic arrest force: The fall arrest system must be designed not to subject a worker who falls to a peak dynamic fall arrest force greater than 8 kN (1800 lbs).



**Retractable Lifeline Fall Arrest System**

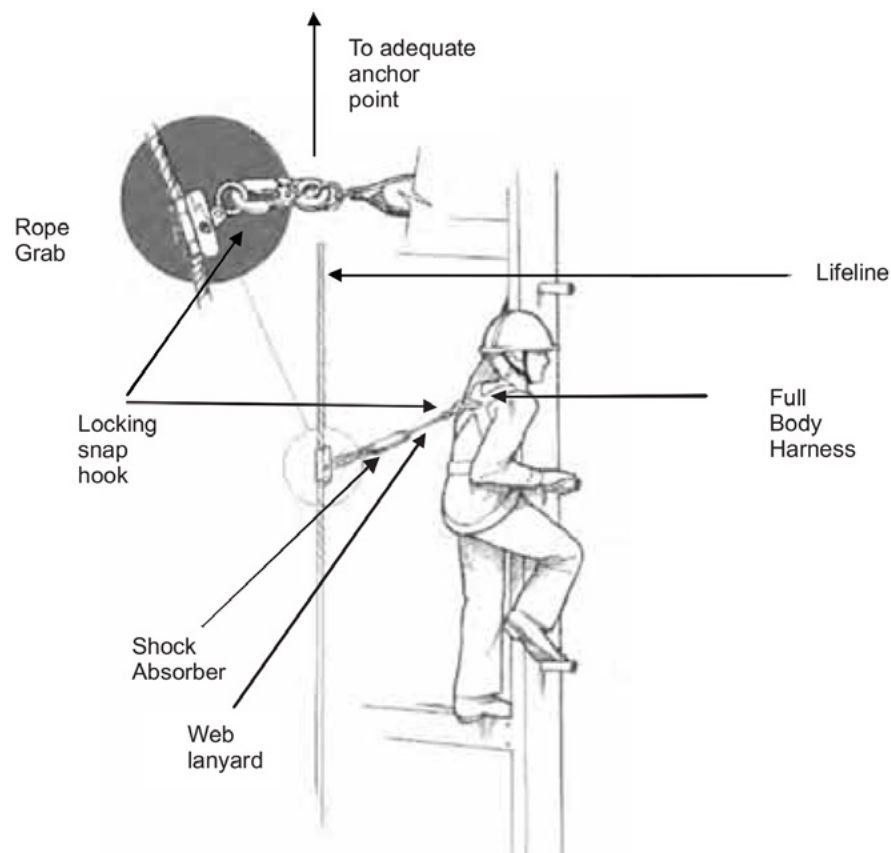




## Vertical Fall Arrest System

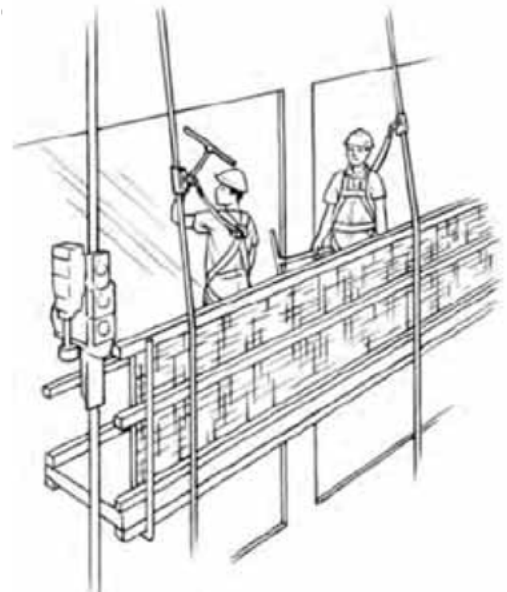
A Vertical Fall Arrest System is a pre-engineered vertical system that arrests the fall of a worker when it occurs. The system consists of: anchor points, vertical lifeline, lanyard, shock absorber, full body safety harness and connecting components. All of these components must be chosen to provide the appropriate level of protection, limit the fall distance to 1.2m (4 ft.) and the peak acceleration force exerted to a person's body to 8 kN (1800 lbs). As a result, the person using the system will not experience bodily harm in case of a fall.

The anchor point for a fall protection system must be installed to provide the required strength for the system. Permanent installations have to have 22.2 kN (5000 lbs.) for every person rigged to the system and have to be installed, maintained and inspected according to professional engineer requirements. A Pull test or Strength test must be conducted to ensure that strength of the anchor is achieved. Inspection protocols shall be developed in order to ensure that the strength of the anchor is maintained (ex. an outdoor permanent anchor must be inspected at least once a year in order to ensure its capacity).



A vertical lifeline must be positively secured to an appropriate anchoring point as described previously. It may consist of a single line secured to a column or overhead beam to which the worker attaches a fall arrestor, or a retractable block device with a lifeline that automatically reels in and out, but engages when a slip or fall occurs. Lifelines must be protected from abrasion or chafing and from sharp corners which can break the lines under heavy shock loads.

Only one worker may be connected to each independent vertical lifeline. If multiple vertical lifelines are used at the same time, each lifeline must be secured to its own, independent anchor point. This limits the loading to which an anchor point is subjected and in the event of anchor failure, restricts the number of lifelines and workers potentially affected by the failure. If a vertical life line is being used at the same time that a worker is using a suspended work platform, the vertical lifeline must be secured to an anchor point that is independent of those supporting the suspended work platform. Suspended work platforms have to be installed and used according to CAN/CSA Z271 Safety Code for Suspended Elevating Platforms and CAN/CSA Z91 Health and Safety Code for Suspended Equipment Operation.



A fall arrest system is also essential with a boatswain chair. The system must be used at all times when a person is getting on, working from, or getting off the chair. A boatswain chair is commonly used in the window cleaning trade. It is very useful in situations where workers must progressively descend from one level to another. It cannot be used to climb. It is standard practice for boatswain chairs to be reeved with two suspension lines. This is because the ropes are easily damaged and the second suspension line provides added safety. A worker using a boatswain chair must have a separate lifeline with a separate anchor attachment.

**Boatswain chair with descent control device**



**Boatswain chair with powered climber**



## Horizontal Fall Arrest System

A Horizontal Fall Arrest System is an engineered horizontal system that arrests the fall of a worker when it occurs. The system must be designed by a professional engineer, inspected after installation, and maintained according to specifications.

Two CSA standards provide detail on the design, testing, installation, manufacturing, labeling and maintenance requirements of these systems: CSA Z259.16 Design of Active Fall Protection Systems and CSA Z 259.13 Flexible Horizontal Lifeline Systems. Refer to the standards for full details or the Workplace Safety and Health Division's Standards Information sheets for summaries of the requirements.

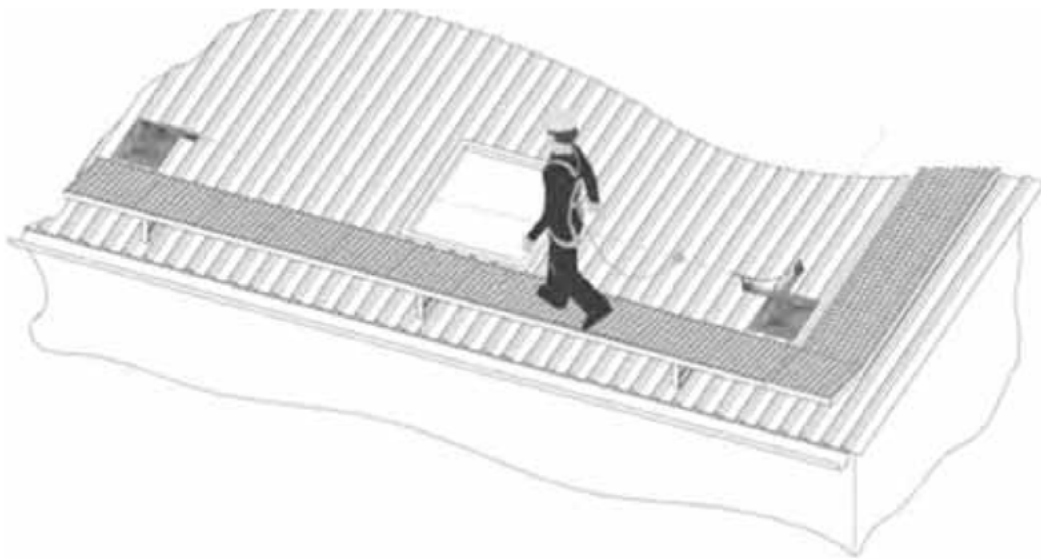
The system consists of: a minimum of two anchor points; horizontal lifeline; lanyard; shock absorber; full body safety harness and connecting components. It can be designed to accommodate multiple workers. The free fall distance must be limited to 1.2 m. (4ft.) and the peak acceleration force exerted to the person falling is 8 kN (1800 lbs), in order to prevent bodily harm.

A horizontal lifeline extends (horizontally) between a minimum of two anchors and consists of a flexible line made of wire, fiber rope, wire rope, or rod, complete with end terminations, and it may have intermediate anchors to reduce sags.

The lifeline must be designed by a professional engineer and prototype tested to ensure that it is capable of supporting the same impact load as a fixed anchor. A standardized horizontal fall arrest system may be used at different project sites, subject to the design criteria of the professional engineer.

The design engineer must approve the number of workers that may be secured to the same static horizontal line.

All other components of these two systems shall meet the requirements outlined in the standards noted.



## Inspection and Maintenance

Fall protection equipment must work properly when it is needed. According to the manufacturer's specifications and section 14.8(1) of M.R. 217/2006, the equipment must be inspected by the worker, or competent person other than the worker using the system, before use on each work shift. The equipment must also be protected from exposure to harsh conditions; kept free from any substance or condition that could deteriorate the equipment; be maintained in good working order according to the manufacturer's specifications; and be re- certified as required by the manufacturer.

Each component comes with instructions for maintenance and inspections. Workers must be trained in the proper maintenance and use of all components.

Before using fall-arrest equipment, check components carefully:

- **Harness** - make sure that straps, buckles, and other hardware are intact and undamaged. Look for frayed, cut, cracked, burned or damaged webbing, and loose or broken stitching. D-ring: look for bent cracked, nicked or gouged rings.
- **Lanyard** - Inspect along the length of the lanyard and eye splices. For a three-strand rope lanyard, carefully twist the rope open to look for worn, broken or cut fibres. Do not overtwist, or the rope could become deformed. Check web lanyards for cuts or holes; for worn or frayed parts, or for damage on load-bearing stitches. Discard the lanyard if any of the above defects are found.
- **Inspect shock-absorbing lanyards regularly.** Look for torn stitching on tear-away types. Check for other types of damage such as cracks and loose parts.
- **Lifelines** - Inspect fibre rope lifelines for fraying, burns, kinking, cuts and signs of wear and tear. Exposure to sunlight causes most synthetic fibre ropes to deteriorate over time. Look for signs of chafing or abrasion; cuts in the yarns or strands; or any visible deformities that would weaken the rope or interfere with the free movement of rope grabs, etc.
- **Check retractable block lifelines for smooth operation.** Pull out the line and jerk it quickly. Braking action should be immediate and maintained (good and tight).
- **Never use lanyards as tow ropes; to lift objects; or for other purposes than for what they are intended.**

## Removal From Service

A fall arrest system that has arrested a fall must be removed from further service until all components are inspected and re-certified as safe for use by the manufacturer or a professional engineer (M.R. 217/2006, section 14.9). Shock absorbers for example, may have partially or completely deployed and self-retracting lifelines may require adjustment, repair or replacement.

## Rescue After Fall

Manitoba Regulation 217/2006, section 14.2 (3 )(c) requires written (fall rescue) safe work procedures to be in place in the event a rescue is required to retrieve a worker after a fall has been arrested. After an arrested fall, the fallen worker remains suspended in mid-air from his or her full body harness, awaiting rescue. In most cases, the worker is not injured and can alter body position within the harness to be more comfortable.

Unfortunately, a worker suspended in an upright position with the legs dangling in a harness of any type may experience “suspension trauma.”

While suspended in a harness, the worker cannot fall into a horizontal position. Fall victims can slow the onset of suspension trauma by pushing down forcefully with the legs; positioning their body in a horizontal or slightly leg-high position; by standing up, or using a body holding device. However, the design of the harness, the attachment points used, or the presence of fall injuries may prevent these actions.

The suspended worker may face several issues:

- (1) the worker is suspended in an upright posture with legs dangling;
- (2) the safety harness straps exert pressure on leg veins, compressing them and reducing blood flow back to the heart; and
- (3) the harness keeps the worker in an upright position, regardless of consciousness.

**Rescue must happen quickly because the suspended worker may lose consciousness in as few as five minutes.**

There are two ways in which a worker may be rescued:

**Simple Rescue Plan** – Used if a worker has fallen and is hanging from a fall protection system, but has not suffered an injury. Equipment that may be used to reach a suspended worker and get them down quickly, include: nylon or rope rescue ladders, extension ladders, manlifts, elevating work platforms, etc.

**Injured Worker Rescue Plan** – Used if a worker has fallen; is hanging from a fall protection system, and has suffered an injury that makes a self-rescue impossible. This type of rescue is much more difficult and complex to perform.

Specially trained and equipped personnel may be needed. In extreme cases, the local emergency services department may use high-reach equipment or rappelling techniques to reach trapped workers and lift or lower them to a safe level.

Rescue plans should cover the on-site equipment, personnel, and procedures for different types of rescue. Any off-site rescue services that might be required should be contacted and arranged in advance to familiarize them with the project. Site management must ensure that:

- Everyone on site is aware of the rescue plan,
- Equipment and other resources are available, and
- Designated personnel are properly trained.



# FIXED LADDERS

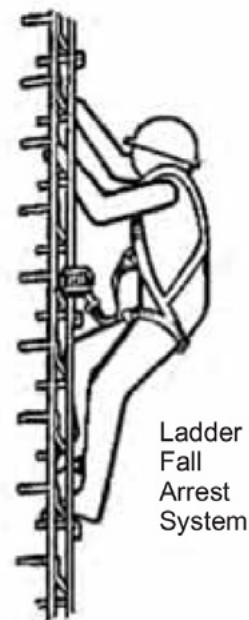
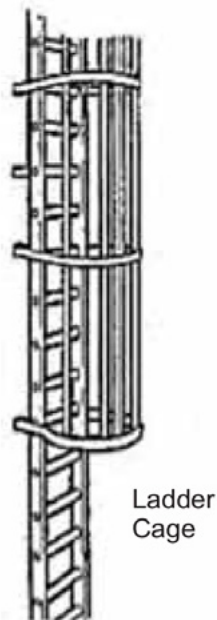
Vertical fixed ladders extending more than 5 m (16 ft) must be equipped to protect a worker from falling. Ladder cages and rest platforms must be provided every 5 m (16 ft), or a fall protection system that meets regulatory requirements.

A ladder cage is a permanent structure attached to a ladder that provides a barrier between the worker and the surrounding space. It serves only as a support to a worker if the worker needs to rest against the barrier. It does not provide fall protection on its own.

A more effective approach is to provide a complete fall arrest system as part of 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 worker to use both hands while climbing up or down.

Should the worker slip or fall, the device would lock instantly and limit the worker's fall to a matter of inches.

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



## Fixed ladders – The following requirements are listed under Part 13 of MR 217/2006:

**13.20(1)** An employer and an owner must ensure that a ladder that is permanently fixed to a supporting building or structure

- (a) is designed by a professional engineer, as is its permanent attachment system to the building or structure;
- (b) is constructed, erected and installed in accordance with the specifications certified by a professional engineer;
- (c) is equipped with a suitable safety gate or equally effective means of protection from falling, at all access openings in floors, platforms and rest platforms;
- (d) where it is in a vertical position or at an angle of not more than 25 degrees to the vertical, it
  - (i) meets the requirements of the ANSI Standard, ANSI 14.3, **Safety Requirements for Fixed Ladders American National Standard for Ladders – Fixed – Safety Requirement**,
  - (ii) has side rails that extend at least one metre above any platform, roof or other landing on the building or structure to which it is fixed,
  - (iii) has an opening in the platform, roof or other landing that does not exceed 750 mm (29 in) by 750 mm (29 in), and
  - (iv) is equipped, if it is more than 5 m high, with a ladder cage or a fall protection system that meets the requirements of Part 14 (Fall Protection), and
  - (v) is equipped, if it is more than 9 m high, with one rest platform at a height of 9 m or less and additional rest platforms at intervals of not more than 5 m; and
- (e) where it is fixed at an angle of more than 25 degrees to the vertical or more than one horizontal to two vertical, it is equipped with
  - (i) a handrail that extends its entire length and is between 800 mm (31 in) and 920 mm (36 in) above the front edge of the treads,
  - (ii) treads that are level and uniform in width and depth and in the vertical distances between them throughout the length of the ladder, and
  - (iii) on an open side, both a handrail and an intermediate rail or equivalent safeguard.

**13.20(2)** Clause (1) (c) does not apply to

- (a) a landing that is serviced by more than one fixed ladder; or
- (b) a fixed ladder installed before the coming into force of this regulation.





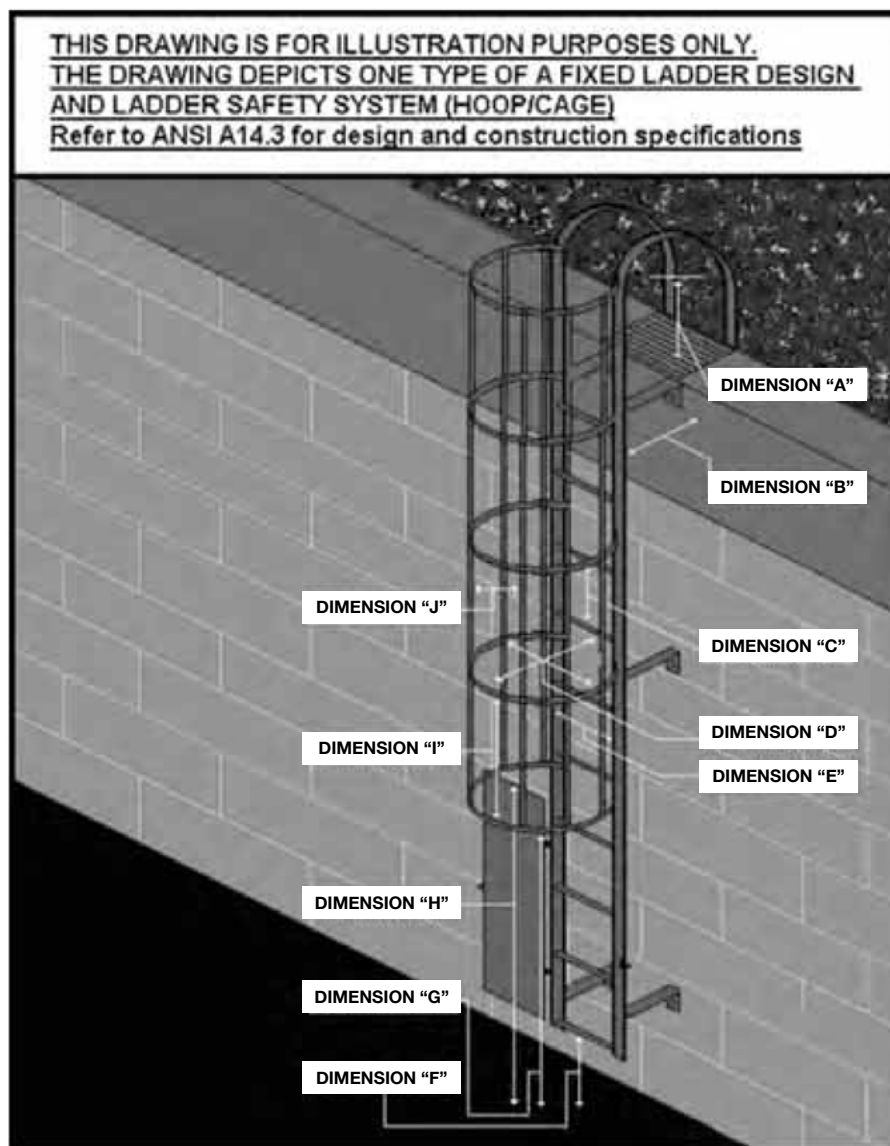
### 13.21 Fixed ladders re multi-level buildings

Employers and owners must ensure that a fixed ladder that complies with the requirements of section 13.20 is used to provide access to every level of a multi-level building that is more than 4 m (13 ft) above the preceding level.

## ANSI Standard A14.3 – Ladders – Fixed - Safety Requirements

This standard outlines minimum requirements for the design, construction and use of fixed ladders, as well as requirements for cages, wells, and ladder safety systems used with fixed ladders in order to prevent personal injuries.

**Note:** see the Dimension Legend on the next page for more details on the illustration





## DIMENSION LEGEND

- A Required distance 3.5 ft (1.07 m) excluding arch. B Minimum 7 in (18 cm)
- C Maximum 12 in (30 cm) between centres, all rungs.
- D From centre of rung 27 in - 30 in (68.5 cm - 76.25 cm) and shall not be less than 27 in (68.5 cm) in width
- E Minimum 16 in (40 cm) clear width between side rails F Maximum 12 in (30 cm)
- G Cage Hoop shall begin at a height of 8 ft (2.44 m) from grade
- H Lockable blank doors to extend high enough to prevent unauthorized access
- I Maximum spacing between hoops 4 ft (1.22 m)
- J Bands shall be spaced a maximum 40 degrees on centre around the circumference of the cage. This will result in a maximum spacing of 9.5 inches (24 cm)

The surface of the parapet between the handrails of the ladder is to be covered by expanded metal decking, a minimum width of 2ft (0.6m), or other non-skid surface acceptable to inspecting authorities. For multi-level buildings, a fixed ladder is required to provide access to every level that is more than 13 ft (4 m) above the preceding level.



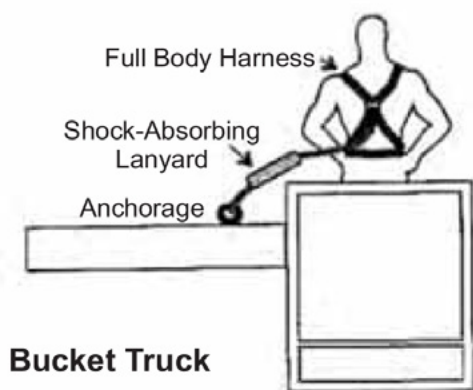
# AERIAL DEVICES AND SELF-ELEVATING WORK PLATFORMS

Fall protection systems are required for all workers working from elevated aerial devices. An aerial device is a vehicle-mounted or trailer-mounted telescoping or articulating device that is used to position a worker at an elevated worksite / work position, and includes:

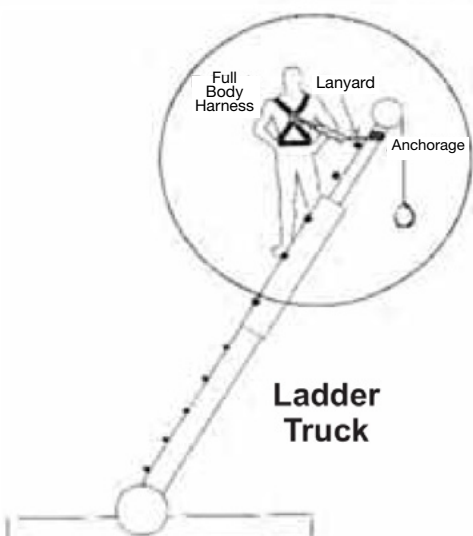
- (a) a work basket or bucket;
- (b) an aerial ladder;
- (c) an extendable and articulating boom platform;
- (d) a vertical tower; and
- (e) any combination of the devices listed in clauses (a) to (d).

A proper fall arrest system, consisting of a full body harness, shock-absorbing lanyard and suitable anchor, must be part of the safe work procedure developed and implemented by the employer.

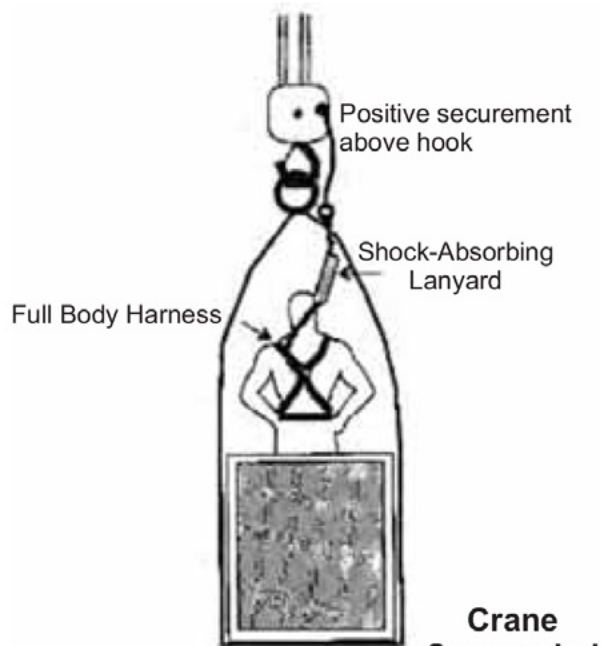
## Example of the types of systems:



**Bucket Truck**



**Ladder Truck**



**Crane Suspended Work Platform**

## Standards regarding self-elevating work platforms and aerial devices

Employers must ensure that a self-elevating work platform or aerial device used at a workplace is designed, constructed, installed, maintained, used and dismantled according to the following standards:

- (a) CSA B354.1 “Portable Elevating Work Platforms”;
- (b) CSA B354.2 “Self-propelled Elevating Work Platforms”;
- (c) CSA B354.4, Self-propelled Boom-Supported Elevating Work Platforms”;
- (d) CSA C225, Vehicle-Mounted Aerial Devices.

Employers must also ensure that:

- a self-elevating work platform or aerial device constructed at a workplace is designed and certified by a professional engineer;
- the professional engineer’s specifications for its construction, installation, maintenance, use and removal follow the standards listed above; and
- the manufacturer’s specifications for a commercially manufactured self- elevating work platform or aerial device used at a workplace follow the standards listed above.

Employers must ensure that structural repairs and modifications to the components of a self-elevating work platform or aerial device are:

- made only under the direction and control of a professional engineer; and
- certified by the professional engineer that the workmanship and quality of the materials used has restored the components to their original capacity or better.

## Scissor Type Powered Platforms



**Boom Type Powered Platforms**



**Push Around Powered Platforms**



## **Guarding (Part 28, section 28.38 of M.R. 217/2006)**

Employers must ensure that each self-elevating work platform and aerial device used at a workplace is equipped with:

- (a) suitable guards to prevent a worker from contacting the moving parts and machinery, including protection from shearing hazards created by the movement of the platform, and
- (b) guardrails and toe-boards on all open sides or an enclosure that is at least 900 mm (36 in) in height.

## **Fall protection (Part 28, section 28.39 of M.R. 217/2006)**

Employers must ensure that a worker using a self-elevating work platform or aerial device:

- (a) uses a fall arrest system that meets the requirements of MR 217/06 Part 14 (Fall Protection) when
  - (i) the platform or aerial device is being elevated, lowered or moved, or
  - (ii) the worker steps beyond the guardrail; and
- (b) has the lanyard of the fall arrest system attached in accordance with the specifications of
  - (i) the manufacturer of the work platform or aerial device, or
  - (ii) a professional engineer.

28.39(2) An employer must ensure that a lifeline is of an appropriate length to prevent a worker from being ejected from the self-elevating work platform or aerial device if it collapses.

28.39(3) Despite the previous subsection, a fall arrest system is not required for a worker who remains within the confines of the guardrail of a scissor lift while the lift is being raised or lowered unless otherwise required by the manufactures specifications.

## **Maintenance, records and manuals (Part 28, section 28.40 of M.R. 217/2006)**

Employers and suppliers are required to do the following, while a self-elevating work platform or aerial device is in their possession:

- (a) maintain it so that it is safe for use;
- (b) keep a permanent record of all inspections, tests, repairs, modifications and maintenance performed on it; and
- (c) ensure that its operator's manual is kept with it.

28.40(2) A record under subsection (1)(b) must include the name and signature of the person who maintains it and the person who performs an inspection, test, repair or modification on it.



## **Signs (Part 28, section 28.41 of M.R. 217/2006)**

Employers and suppliers of a self-elevating work platform or aerial device must ensure that the platform or device has signs that are clearly visible and legible to an operator at its controls indicating the following:

- (a) the identity of the supplier;
- (b) the name and number of the standard to which the platform or aerial device was designed;
- (c) its rated load;
- (d) all limiting operating conditions, including the use of outriggers, stabilizers and extendable axles;
- (e) the specific firm level surface conditions required for use of the platform or aerial device in the elevated position;
- (f) any warnings specified by the manufacturer;
- (g) except for a boom-type elevating work platform, the direction of machine movement for each operating control.

The CSA standards (listed on page 39) have specific requirements for signage. Refer to the Standard or the Workplace Safety and Health Division's Standard Information Sheet for details.

## **Climbing prohibited (Part 28, section 28.42 of M.R. 217/2006)**

Employers must ensure that no worker climbs on the extension mechanism or the boom of a self-elevating work platform or aerial device.

## **Use of the self-elevating work platform or aerial device (Part 28, section 28.43 of M.R. 217/2006)**

Employers must ensure that a self-elevating work platform or aerial device

- (a) is used only in accordance with the specifications of its manufacturer or those of the professional engineer who designed it;
- (b) is not loaded in excess of its rated load, or loaded or used in a manner that affects its stability or endangers a worker;
- (c) is used only on a firm level surface that complies with the conditions required for its use;
- (d) is not moved unless all workers on it are protected from falling; and
- (e) when elevated, is accessed by a worker only if procedures for doing so have been established in accordance with the manufacturer's specifications or those of the professional engineer who designed it, and then only in accordance with those procedures.

## **Inspection (Part 28, section 28.44 of M.R. 217/2006)**

Employers must ensure that a competent person inspects a self-elevating work platform or aerial device before it is first used and daily when it is in use.

# FALL CONTAINMENT SYSTEMS

## Safety Nets

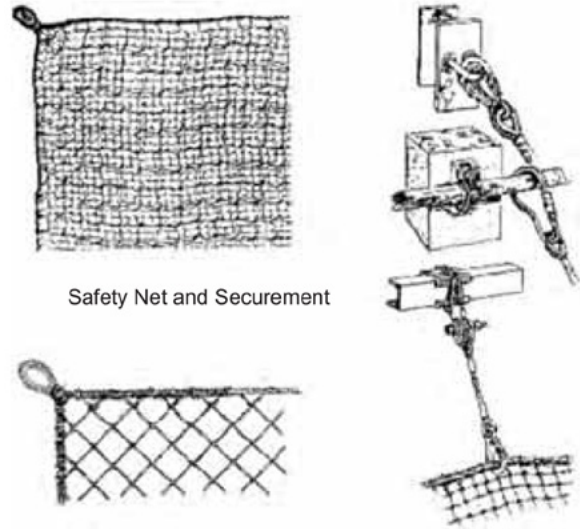
Safety nets are most often used when it is not practical to provide a fixed barrier or fall arrest systems at the work site (ex. bridge work; structural steel erection). In these cases, it may be difficult or impossible to install guardrailing or to provide a proper anchoring and lifeline system for fall arrest.

Safety nets must be designed, installed, tested and maintained according to ANSI Standard A10.11. The net must be installed so that it extends at least 2.5 m (8 ft) on all sides beyond the work area and not more than 7.7 m (25 ft) below the work surface.

## Inspection and testing of safety nets

If a safety net is used, employers must ensure that a professional engineer or a competent person under a professional engineer's supervision inspects and tests the installation of the safety net before it is made available for use. The net must also be inspected by a competent person before each work shift.

**A competent person possesses knowledge, experience and training to perform a specific duty.**



Safety Net and Securement



# CRANE SUSPENDED WORK PLATFORMS

A crane supported work platform is to be used for hoisting workers and their immediate tools **ONLY** (employers may decide to use tag lines in order to minimize lateral move of the platform).

***No person is allowed to ride on a suspended work platform until the Workplace Safety and Health Division has been notified and a serial number has been assigned to the project, according to the requirements under section 28.22 of M.R. 217/2006.***

## General restriction regarding use of cranes

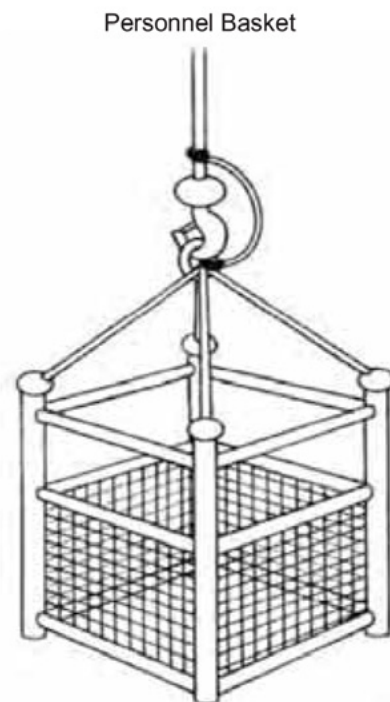
Employers may only permit a crane to be used to hoist a personnel basket or cage if it is not practical to carry out the required work by using a scaffold or other type of elevated work platform (that does not include the use of a crane).

The prior notification requirements apply whenever a crane is used to hoist a personnel basket or cage, regardless of the height of the hoisting operation:

## Basket or cage requirements

When a crane is used to hoist a personnel basket or cage, employers must ensure that the personnel basket or cage:

- (a) is designed by a professional engineer, according to CSA Standard Z150 - 98 (R2004), Safety Code on Mobile Cranes, and is constructed according to the design drawings prepared by the engineer;
- (b) is equipped with
  - (i) anchor points located above the load hook of the personnel basket or cage for the attachment of a worker's fall arrest system,
  - (ii) a guardrail that meets the requirements of Part 14 (Fall Protection), and
  - (iii) a skid resistant deck;
- (c) has more than one method of suspension or support, and is designed, constructed and maintained so that failure of one method will not cause the collapse of all or part of it;
- (d) is designed and constructed so that it remains horizontal at all times;
- (e) is suspended from, or supported by, a direct attachment to the boom of the crane;
- (f) has the following legibly and permanently marked on it in a visible place:
  - (i) the maximum number of workers allowed to occupy the personnel basket or cage,
  - (ii) its weight,
  - (iii) the crane type for which it has been designed,
  - (iv) any other information necessary for safe operation of the personnel basket or cage.





## Inspection and certification

Employers must ensure that the professional engineer who designed the personnel basket or cage:

- (a) inspects it before its first use; and
- (b) certifies that it has been manufactured according to design specifications.

## Crane requirements and documentation

Employers must ensure that a crane used to hoist a personnel basket or cage:

- (a) is equipped with:
  - (i) fail-safe mechanisms that prevent the boom and the personnel basket or cage from free falling in the event of a power or system failure, or the unintentional release of any operating controls, and
  - (ii) an automatic limit switch that prevents the personnel basket or cage and load from reaching beyond the highest permissible position specified by the crane manufacturer;
- (b) has, on its hoist line, hooks that are equipped with self-closing safety latches at the point where the personnel basket or cage is suspended;
- (c) is not used to hoist material when the personnel basket or cage is being used to support a worker;
- (d) is not loaded in excess of 25% of its rated load; and
- (e) has a clearly visible and legible load chart, revised according to clause (d) by a professional engineer, that is attached in a visible place on the crane

Employers must keep all documents required under the regulation with the crane at all times during a hoisting operation (ex. design drawings, test reports, written statements, certification, etc.).

## Operating requirements

If a crane is used to hoist a personnel basket or cage, employers must ensure:

- (a) emergency rescue procedures are developed and implemented for the hoisting operation;
- (b) the workers involved in the hoisting operation are informed of emergency rescue procedures;
- (c) there is an adequate means of communication between workers in the personnel basket or cage and the crane operator; and
- (d) every worker in the personnel basket or cage
  - (i) wears a full body harness that is connected independently to a fixed anchor point located above the crane's load hook, and
  - (ii) uses the harness according to Part 14 (Fall Protection) of M.R. 217/2006.



# ROPE ACCESS

Rope access is an emerging fall protection system that is being used in place of traditional systems to access work at heights. Rope access is defined as a technique in which a rope access system is used to provide a person with access to and from a workplace, commonly including suspension at the workplace, in such a way that a fall is prevented or arrested.

Rope access is included in *Manitoba Regulation 217/2006: Part 28 – Scaffolds and Other Elevated Work Platforms*. As such, some of the requirement within Part 28 may apply to Part 28.1.

This section provides general guidance on rope access requirements. It cannot cover all situations that may occur on a project, and users of this guide should consult the Workplace Safety and Health Act and Regulation to ensure they are meeting the requirements of the legislation.

## When may rope access work be performed?

An employer may only allow workers to perform rope access work if it is not practically feasible for the workers to comply with *Part 14 Fall Protection* while performing the work in question.

Rope access does not apply to: firefighters, persons providing emergency response services, recreational or leisure activities that involve a rope access system, including workplaces where such activities are taught.

## Safe Work Procedures and Planning

If not already required within either Part 14 or Part 28, an employer must ensure that rope access work is planned, performed and supervised in accordance with the requirements of the International Code of Practice (2014), published by the Industrial Rope Access Trade Association (IRATA) or *Safe Practices for Rope Access Work (2017)*, published by the Society of Professional Rope Access Technicians (SPRAT). In addition, an employer must:

- (a) develop and implement safe work procedures respecting rope access work, including the rescue procedures to be used in case of equipment malfunction or a fall or injury that leaves a worker suspended or requiring rescue
- (b) train workers in the safe work procedures; and
- (c) ensure that workers comply with the safe work procedures.

## Training and Certification

Valid certification of training issued by the association or society referenced above must be available at the workplace and produced for inspection by request of a safety and health officer; workers must only perform or supervise work within the scope of their certification.

Workers who perform rope access work must receive training in the safe use of the rope access system, including, as appropriate to the work being done, the safe work practices, skills and practical experience hours set out in the following groups of publications:

- (i) *International Code of Practice (2014) and Training Assessment and Certification Scheme (2015)*, published by IRATA
- (ii) *Safe Practices for Rope Access Work (2017) and Certification Requirements for Rope Access Work (2019)*, published by SPRAT

## Equipment

Equipment for rope access must be selected, used and maintained in accordance with the requirements of the *International Code of Practice* (2014), published by IRATA or *Safe Practices for Rope Access Work* (2017), published by SPRAT.

Rope access systems consist of, but are not limiting to, the following:

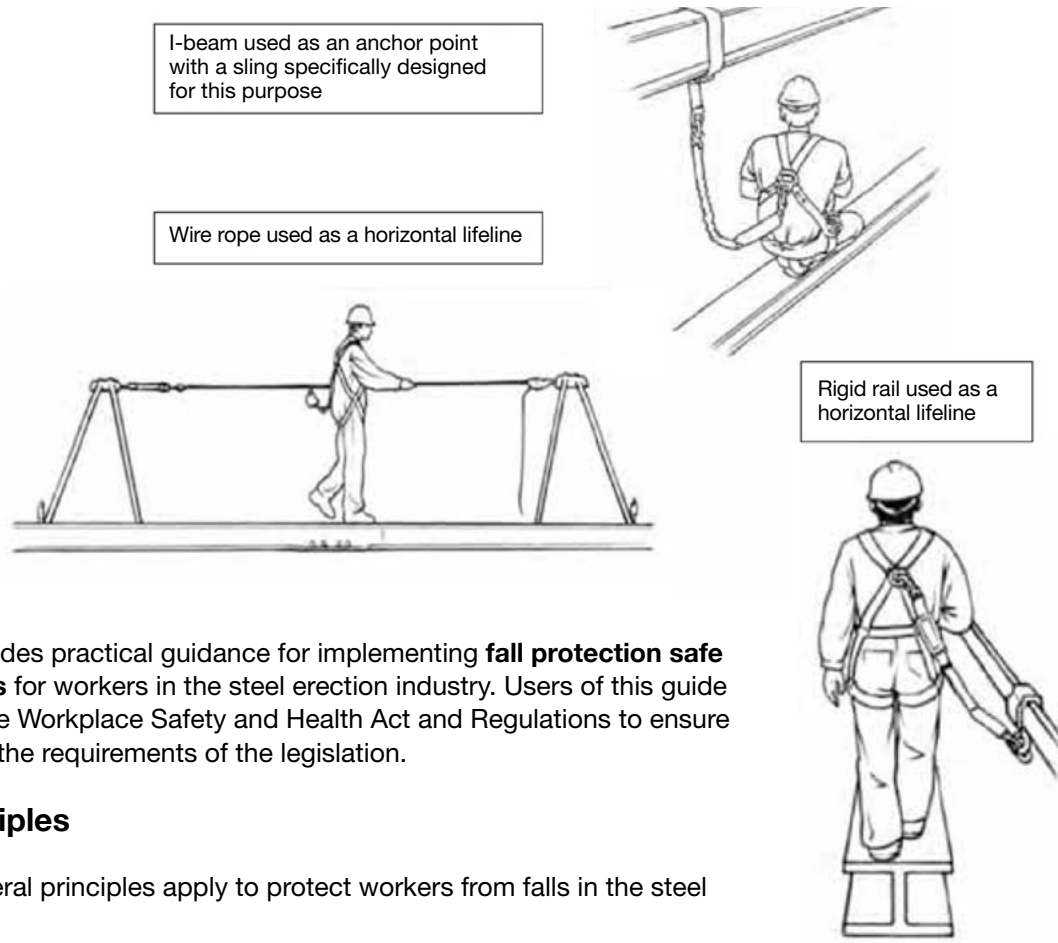
- a sit or full body harness
- rope, lanyards and other connecting equipment
- anchors
- other components such as ascenders, descenders, belay devices, backup devices and fall arresters

These systems must employ two separately secured subsystems the first providing a means of access and the second providing a safety, secondary, belay or backup system but does not include a boatswain's chair or a zip line.



# STEEL ERECTION INDUSTRY

Part 14 of Manitoba Workplace Safety and Health Regulation, M.R. 217/2006 requires workers to be protected from falls when working at heights of 3 m (10 ft) or more.



This section provides practical guidance for implementing **fall protection safe work procedures** for workers in the steel erection industry. Users of this guide should consult the Workplace Safety and Health Act and Regulations to ensure they are meeting the requirements of the legislation.

## General Principles

A number of general principles apply to protect workers from falls in the steel erection industry:

- All workers must be protected from falls at heights greater than 3 m (10 ft).
- Employers must develop and document a Fall Protection Safe Work Procedure for each project.
- Employers must provide fall protection systems on all projects, including one or more of the following:
  - Guardrails / Barriers
  - Scaffolds
  - Elevating work platforms
  - Crane supported work platforms
  - Safety nets
  - Fall arrest systems
- Workers must wear/use personal protective equipment (fall arrest) provided by the employer, including:
  - Full body safety harness
  - Lanyard

- Shock absorber
- Anchor Point
- Lifeline (Horizontal or vertical )
- Snap Hook

When carrying out steel erection work, the general principle for fall arrest is that a worker must be connected at all times to the fall arrest system if no other fall protection has been provided. This may mean that workers will be equipped with a double lanyard system, to allow security at all times when moving from one system to another.

Fall arrest systems must be designed to restrict a worker's fall to 1.2 metres (4 ft) or less, and maintain clearance from objects in the event of a fall.

## Steel frame building requirements

Part 14 (section 14.28) of M.R. 217/2006 states that during the construction of a steel frame building, the owner of the building and the prime contractor responsible for the construction of the building must ensure that the structural components of the building designed to accommodate a fall protection system:

- (a) are designed, approved and certified as safe by a professional engineer; and
- (b) include
  - (i) double connections at each column and at beam webs over a column,
  - (ii) at least four anchor bolts per column, and
  - (iii) perimeter columns that extend at least one metre above the finished floor to permit the installation of perimeter safety cables.

## Structural connection

When erecting steel structures, the stability of the structure (under construction) poses challenges to workers and employers. Fall protection systems that will be tied into the future structure introduce additional loads to the temporary structure.

When two structural members on opposite column web, or a beam web over a column, are connected and share common connection holes, at least one bolt with its wrench-tight nut must remain connected to the first member.

## Clipped end connection and staggered connection

Clipped end connections are connection material on the end of a structural member that have a notch at the bottom and/or top to allow the bolt(s) of the first member "A" placed on the opposite side of the central member to remain in place (see Diagram 1). The notch(es) fits around the nut or bolt head of the opposing member to allow the second member to be bolted up without removing the bolt(s) holding the first member.

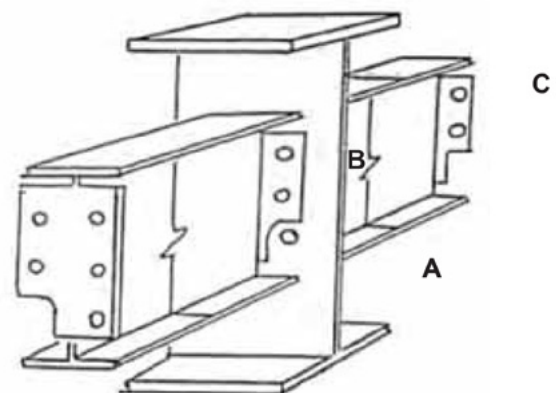
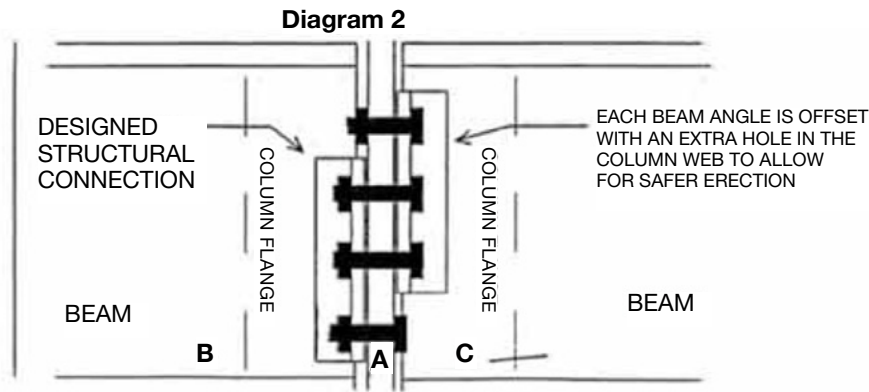


Diagram 1





Staggered connections are connection material on a structural member in which all of the bolt holes in the common member web of piece “A” (see Diagram 2) are not shared by the two incoming members (pieces “B” and “C” – Diagram 2) in the final connection. The extra hole in the column web allows the erector to maintain at least a one bolt connection at all times while making the double connection.

## Anchor Points

### Lifeline anchors

If roof-level protection consists of a system of lifeline anchors, employers must ensure:

- (a) each life line anchor is
  - (i) capable of resisting a force of 22.2 kN (5000 lbs) in any direction in which the load may be applied for each worker attached; and
  - (ii) made of stainless steel or other material resistant to corrosion;
- (b) the anchor system is certified by a professional engineer as having the required load capacity; and
- (c) if an eyebolt is used as an anchor, the interior opening of the eye measures at least 38 mm (1 ½ in).

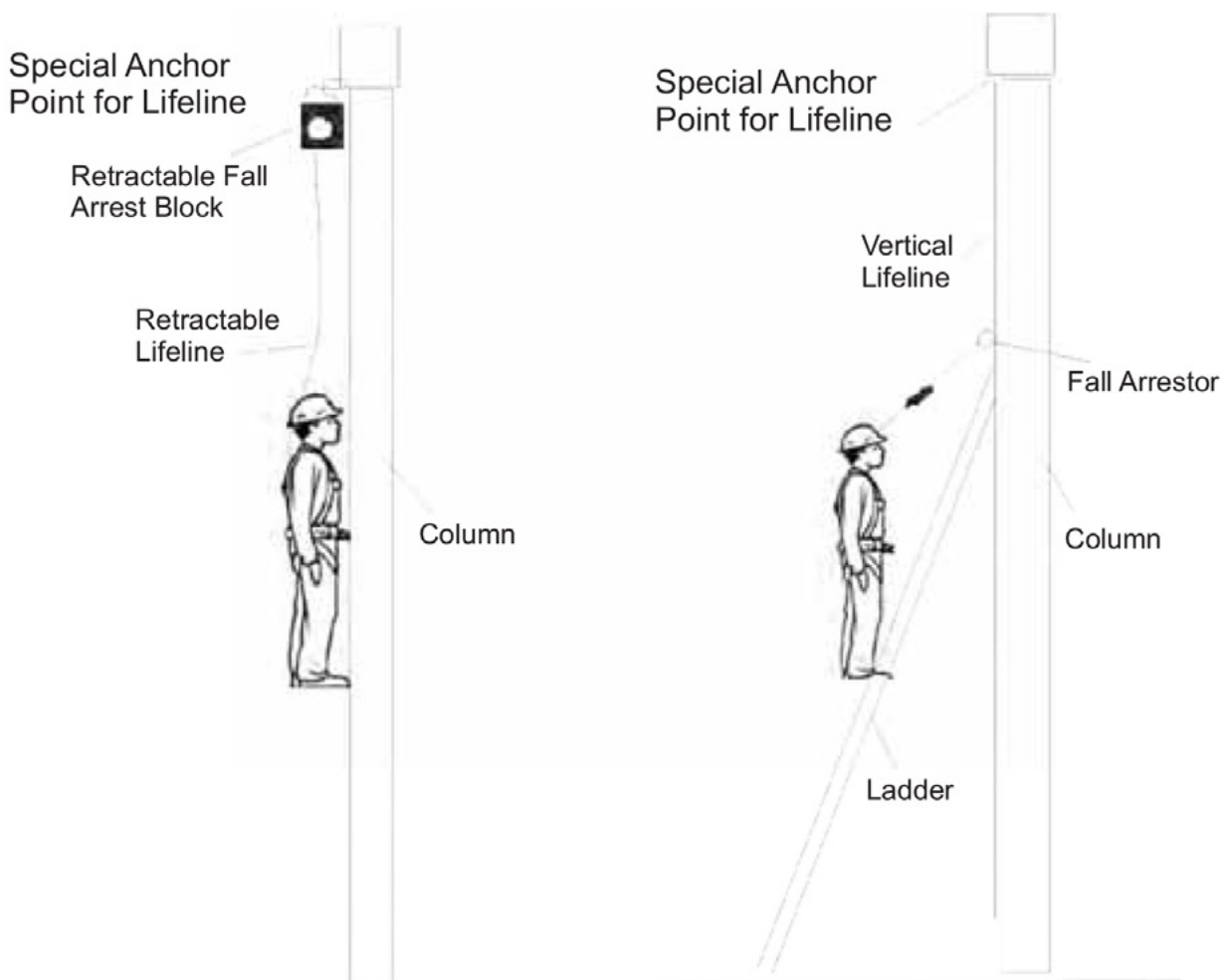
Anchorage points may consist of rated eyebolts, drilled holes, welded or bolted steel plates, beam clamps, or other devices designed to carry the design load for the fall arrest application. The anchor attachment point should not be the connection bolt holes; it must be a separate anchor system designed for vertical or horizontal lifeline orientation, and capable of carrying the design load 22.2 kN (5000 lbs) force in the anticipated direction of the loading.

Clamp-on type anchors may be used if they meet the requirements above. These anchors must be attached in positions on the structural members according to the design specifications of those members.

## Erection procedures

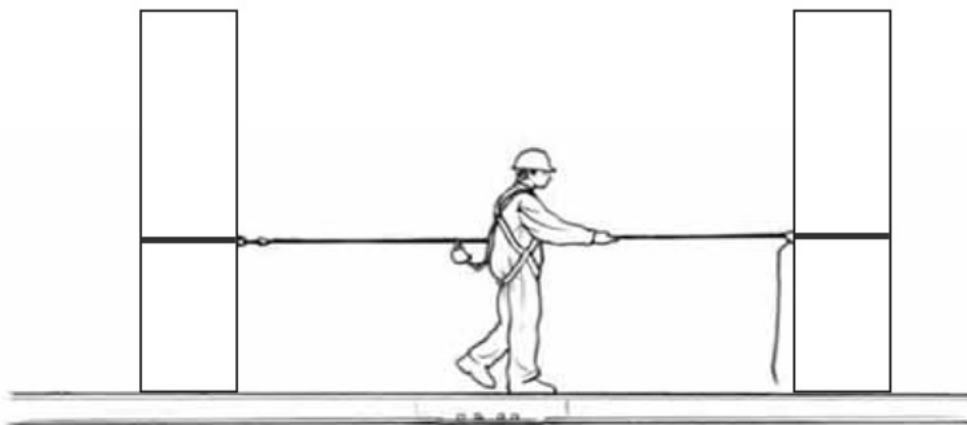
### Columns

Before a worker climbs a column, it must be properly secured and a fall arrest system must be provided. The fall arrest system may consist of a vertical lifeline extending from the top of the column to the base or a retractable block device anchored at the top of the column. The fall arrest system should be in place prior to erecting the column so that the worker does not need to climb a ladder or use other means to secure the fall arrest system.



## **Beams**

Horizontal static lines should be installed before erecting steel beams. If horizontal fall arrest systems are installed after erecting, safe work procedures must be in place to protect workers from falling as the systems are installed. This may include using a powered elevating work platform or securing the worker to a column lifeline system, as long as travel distances away from the column do not allow for a large swing radius in case of a fall.



## **Pre-Engineered Structures**

If a horizontal static line will be used for fall protection on a pre-engineered steel building, it must be approved by an engineer and reviewed by the building's designer. Care must be taken to ensure that the anchor system will not result in structural instability of the building at any point in its erection, should a fall occur.



# ROOF WORK

Part 14 of Manitoba Workplace Safety and Health Regulation, M.R. 217/2006 requires workers to be protected from falls when working at heights of 3 m (10 ft) or more.

This section provides practical guidance for implementing Fall Protection Safe Work Procedures for workers in the roofing industry. It cannot cover all situations that may occur on a construction project site, and users of this guide should consult the Workplace Safety and Health Act and Regulation, M.R. 217/2006 to ensure they are meeting the requirements of the legislation.

Special systems and combinations of control measures are required in the roofing industry. Each job must be assessed for the particular fall hazards present, and documented safe work procedures must be developed for each construction project site.

## General Requirements

Before any work begins on the roof of a building, employers must ensure that the structure of the building is evaluated and determined to be capable of supporting loads on the roof, including workers, equipment and materials.

## General Principles

A number of general principles apply to fall protection for workers:

- All workers shall be protected from falls at heights greater than 3 m (10 ft) or a vertical distance of less than 3 m where there is an increased risk of injury due to the surface or item on which the worker might land:
  - a) into operating machinery or moving parts of the machinery;
  - b) into water or another liquid;
  - c) into or onto a hazardous substance or object, eg. concrete;
  - d) through an opening on a work surface; or
  - e) a vertical distance of more than 1.2 m from an area used as a path for a wheelbarrow or similar equipment.
- Employers must develop and document Fall Protection Safe Work Procedures for each project.
- Employers must provide fall protection systems on all projects, including one or more of the following:
  - a) Floor Opening Protection
  - b) Fall Arrest Systems
  - c) Guardrails
  - d) Warning Barrier/Control Zones
- Workers must wear/use personal protective equipment for fall arrest, provided by the employer, including:
  - Full Body Safety Harness
  - Lanyard
  - Shock Absorber
  - Anchor Point
  - Lifeline
  - Snap Hook



## Fall Protection Safe Work Procedures

Employers must develop and implement Fall Protection Safe Work Procedures prior to work starting on a project. Refer to the Division's SAFE Work Bulletin # 249 (2 of 2).

The prime contractor for the construction project site must ensure all sub- contractors provide supervisors safe work procedures prior to the start of the project. Safe Work Procedures must be available at the jobsite for all persons to review.

Safe Work Procedures are to be documented and include:

- responsibilities of supervisors and workers on the project
- fall protection methods to be used
- personal protective equipment to be used
- rescue plan, where applicable

Selection of a fall protection system to control the hazard to the worker depends on the circumstances and the job. The best choice of a fall protection system will be one that removes the risk of falling entirely. For example, it is preferable to provide a guardrail to prevent a worker from falling rather than personal protective equipment (full body safety harness, lifeline, and shock absorber).

## Training

Employers must train roof workers in the safe work procedures.

## Worker To Comply

Employers must ensure that roof workers comply with the safe work procedures. This includes cooperating with the employer in complying with the safe work procedures.



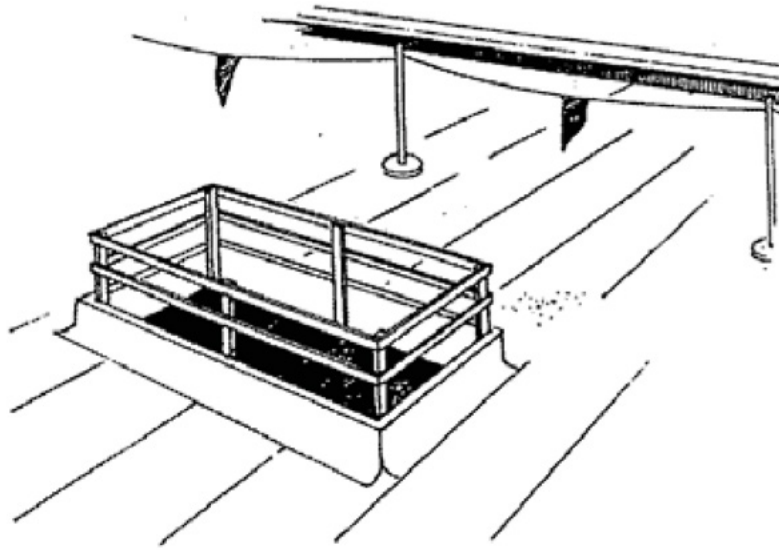
## Roof Openings

Guardrails must be provided around all roof openings not fitted with permanent or temporary covers.

Temporary covers should not extend more than 150 mm (6 in) beyond the side of the openings they are covering to allow most of the roof work to be completed with the cover in place. Temporary covers must appropriately identify the hazard.

Permanent covers or hatches should remain closed during roofing operations, except when they are used by the roofing crew for access or when they are removed to complete application of felts over the curb on which they are set.

If guardrails around openings or hatch covers are removed to complete the roofing work, the workers must be protected by using a fall-arrest system. The work area should also be roped off and danger signs posted to warn other workers of the hazard.



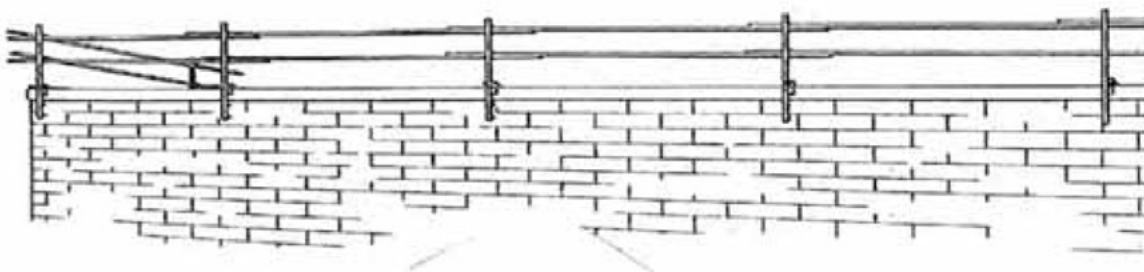
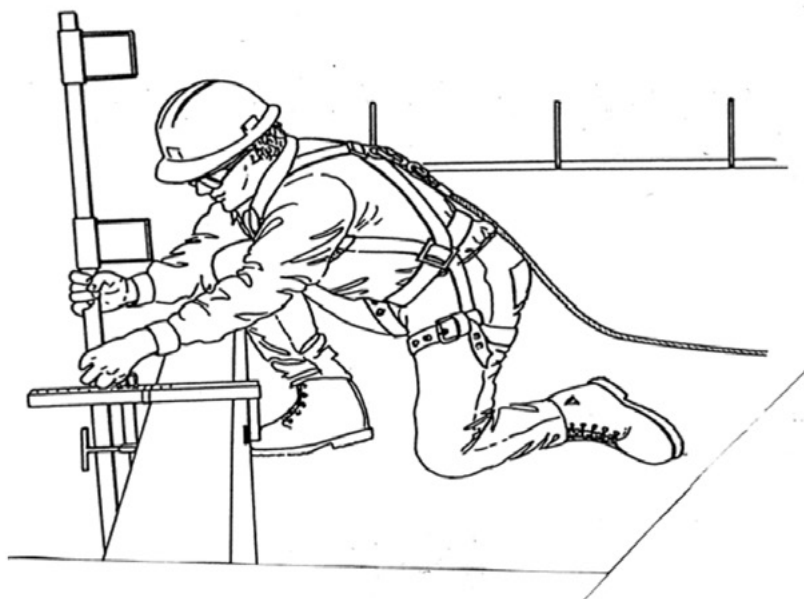
## Work near roof edge

### Guardrails

Workers must not work within 2 m (6.5 ft) of a roof edge without using fall protection (travel restraint system) unless temporary guardrails or warning barriers are in place.

Temporary guardrails around the work area must be securely attached to the building.

Workers installing temporary guardrails must use a fall-arrest system if they are closer than 2 m (6.5 ft) to the roof edge. Roof areas not protected by guardrails should be equipped with a warning barrier 2 m (6.5 ft) from the roof edge.

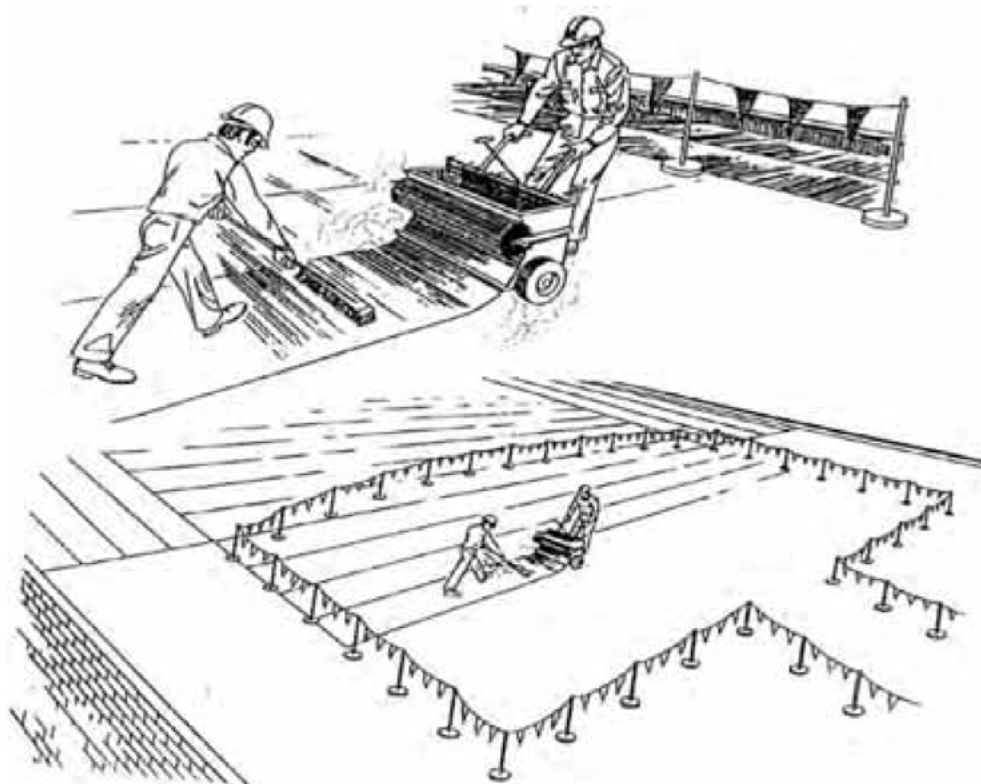


## Warning Barriers / Control Zones

Warning Barriers / Control Zones used as alternatives to temporary guardrails must be set up around the work area at least 2 m (6.5 ft) from the perimeter.

For the purpose of this document, the work area is the area where roofing work is taking place, including the removal or application of roofing materials and the delivery, movement, or storage of materials. All of this work may be done without any requirement for fall protection other than the warning barrier itself.

A warning barrier should be between 900mm (36 in) to 1060mm (42 in) in height and as shown in the diagram below, consist of weighted posts for stability and a fibre rope with flags or warning signs.



If working outside the warning barrier/control zone, the lifeline of the fall-arrest system must be secured to an anchor. The load exerted by a falling human body is considerable, therefore the anchor must have a minimum capacity for 5000lbs (22kN) force in any direction.

The lifeline should be kept reasonably taut without a lot of loose line between the worker and the anchor. Retractable block lifelines remain taut automatically and are recommended where the line will not come in contact with sticky materials.

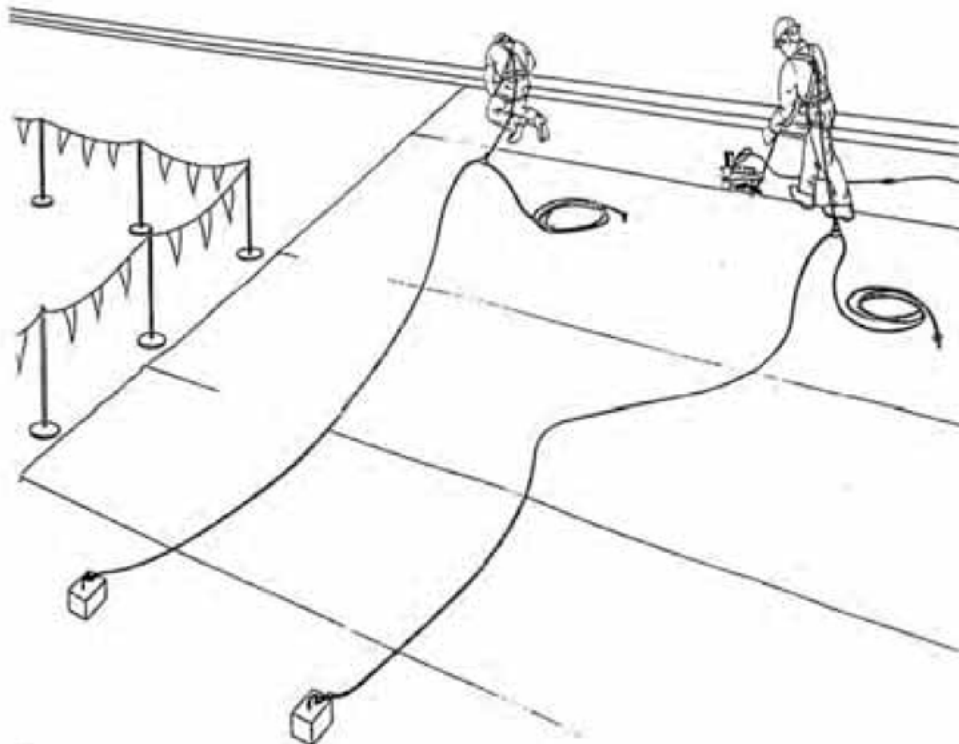


The lifeline anchor location should be chosen to minimize pendulum motion in the event of a fall-arrest. This means that the anchor point should be directly behind the worker and **no more than 10 degrees** off each side of the perpendicular line drawn straight back from worker's position. The length of lifeline is not of great concern if the anchor point is kept within this limit.

Lifeline anchor may consist of either permanent building maintenance anchor points or structural features of the building.

Adequate structural features include large HVAC units, mechanical rooms or roof access rooms.

Never anchor lifelines to small air conditioners, condensers, drain covers, stink pipes, roof hatches, fixed ladders, handrails, or satellite dishes.



## Material Supply

### Roofing Hoists

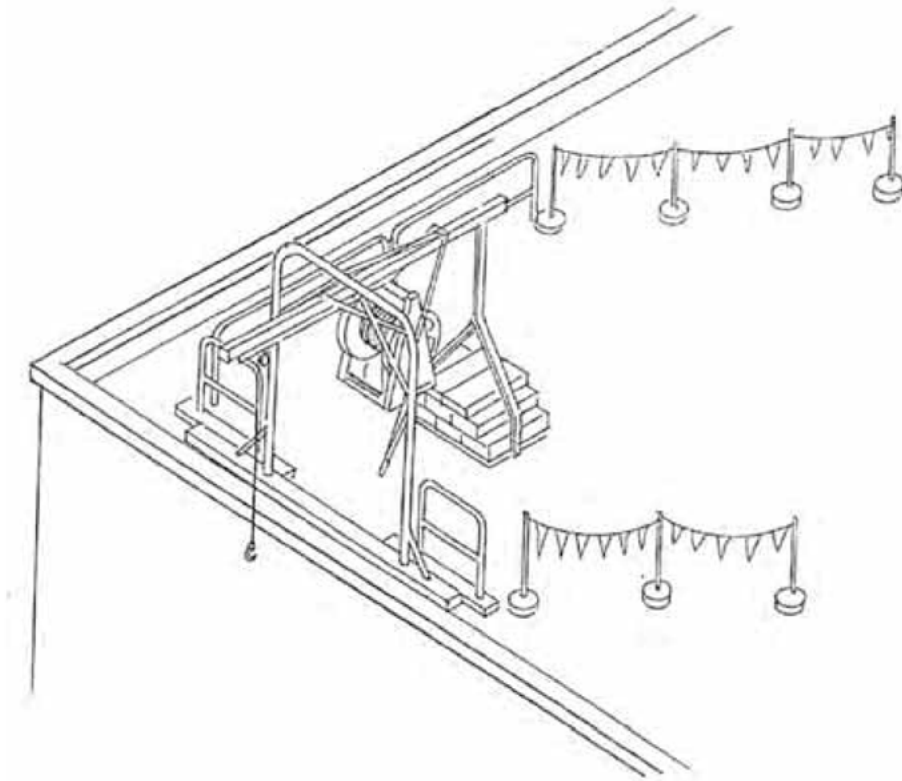
Roofing hoists located at the perimeter must be erected with guardrails which

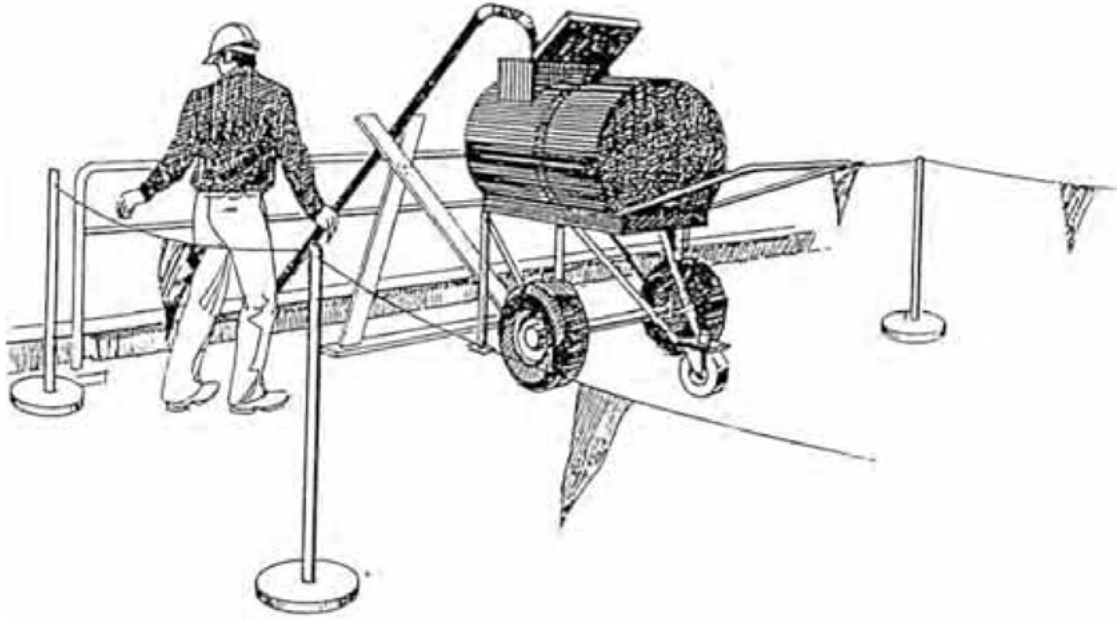
extend at least 900 mm (3 ft) on both sides of the frame and which are set up in accordance with the manufacturer's instructions.

Wherever possible, a roofing hoist should be set up at least 3 m (10 ft) from a corner.

If a hoist has to be set up closer to a corner for proper access, an additional guardrail must be attached to the guardrail on the hoist and a warning line set up.

A roofer's hoist must be erected so that the hoist cable remains vertical at all times while a load is being hoisted. In addition, the hoist arrangement must have a safety factor of no less than three (3) against overturning. (Refer to Part 23 of the workplace safety and health regulation for roofer's hoist requirements.)





### **Bitumen Pipe Discharge Area**

If hot bituminous material (“hot stuff”) is pumped to the roof and discharged into a hot stuff container or other similar device within 2m (6.5 ft) of the roof edge, a guardrail or barrier should be installed at the roof edge. The pipe supplying the bituminous material should also be properly supported and held in position so that any deflection or movement will not present a hazard to workers on the roof.

The hot stuff container or similar device supplied by the discharge pipe must be fixed or blocked in position and the pipe securely fastened to it.



## Ladders for Roof Work Safety Checklist:

Refer to Part 13 of the workplace safety and health regulation.

- Check the ladder for defects at the start of the shift and after it has been used in other locations by other workers
- Inspect the ladder for structural integrity. Hardware and fittings should be securely attached and free from damage, excessive wear, and corrosion. Movable parts should operate freely without binding or excessive play.
- Frayed or worn ropes on extension ladders should be replaced with a size and type equal to the manufacturer's original rope.
- Aluminium ladders should be checked for dents and bends in side rails, steps, and rungs. Repairs should be made only by the manufacturer or manufacturer's agent.
- The top of the ladder should be tied off or otherwise secured once it is in position.
- If a ladder is used for access from one work level to another, the side rails should extend a minimum of 1 m (3 ft) above the landing.
- All straight extension ladders should be erected at an angle so that the horizontal distance between the top support and the base is not less than one-quarter or greater than one-third the vertical distance between these points.
- Short ladders must never be spliced together to make a long ladder.
- Unless proper barricades have been erected, ladders should not be set up in passageways, doorways, driveways or other locations where they can be struck by persons or vehicles.
- Only one person at a time should be allowed on a single-width ladder.
- Always face the ladder when climbing up or down and when working from it.
- Never climb up or down a ladder while carrying anything in your hands. Tools, equipment, and materials should be placed in a container and raised or lowered by rope.
- Never rest a ladder on its rungs. Ladders must rest on their side rails.
- Contact public utilities if you are working near, or capable of making contact with an overhead power line. (Refer to Part 25 of the workplace safety and health regulation.)

NOTE: Ladders found to be defective should be taken out of service immediately and tagged, **"DANGER DO NOT USE."**



# RESIDENTIAL CONSTRUCTION

“Residential Construction” means construction work where the construction materials, methods and procedures are used for single and multiple family dwelling construction projects, and the dwelling is designed with an eave elevation of not more than 6 m (20 ft).

Regulations under the Workplace Safety And Health Act require workers to be protected from falls when working at heights of 3 m (10 ft) or greater.

This section provides general guidance in developing and implementing Fall Protection Safe Work Procedures for workers in this industry. It cannot cover all situations that may occur on a project, and users of this guide should consult the Workplace Safety and Health Act and regulations to ensure they are meeting the requirements of the legislation.

Residential construction presents unique circumstances and challenges when it comes to fall protection for workers. Each job must be assessed for the particular fall hazards presented, and a Safe Work Procedure developed.

## Safe Work Procedures & Training

Employers must develop and implement Safe Work Procedures for Residential Construction, train workers on the Safe Work Procedures and ensure that workers comply with the Safe Work Procedures. For information on how to conduct a Job Hazard Analysis and how to develop Safe Work Procedures see Safe Work Bulletins 249 (1 of 2) and 249 (2 of 2).

## General Principles

There are a number of general principles that apply to protecting workers from falls:

- All workers shall be protected from falls at heights greater than 3 m (10 ft) or a vertical distance of less than 3 m where there is an increased risk of injury due to the surface or item on which the worker might land:
  - a) into operating machinery or moving parts of the machinery;
  - b) into water or another liquid;
  - c) into or onto a hazardous substance or object, eg. concrete;
  - d) through an opening on a work surface; or
  - e) a vertical distance of more than 1.2 m from an area used as a path for a wheelbarrow or similar equipment.
- Employers must develop and document Fall Protection Safe Work Procedures for each construction project site.
- Employers must provide fall protection systems on all projects, which shall include one or a combination of the following measures:
  - a) Guardrails and/or Warning Barriers / Control Zones
  - b) Floor Opening Protection
  - c) Travel Restraint and
  - d) Fall Arrest Systems

- Workers must wear and use Personal Protective Equipment (Fall Arrest) provided by the employer which shall consist of the following:
  - Full Body Safety Harness
  - Lanyard
  - Shock Absorber
  - Anchor Point
  - Lifeline
  - Snap Hook

## Fall Protection Safe Work Procedures

Due to the complexity and variation in projects, it is required that Fall Protection Safe Work Procedures be developed by the employer prior to work commencing on the project.

The Safe Work Procedure is to be documented and include:

- responsibilities of supervisors and workers on the project
- erection or dismantling plans and sequence of activities
- fall protection methods to be used
- engineering design requirements
- personal protective equipment to be used
- rescue plan

The Safe Work Procedure must be available at the jobsite for all to review and consult.

The selection of the particular fall protection system to control the hazard to the worker is dependent upon the circumstances and the job task. Ideally, the choice of a protection system will be one that removes the risk of falling entirely. For example, it is preferable to provide a fixed barrier to prevent a worker from falling, than personal protective equipment (full body safety harness and lifeline). In this way, the worker is never in a position where an actual fall may occur. Otherwise, the worker must rely on the personal protective equipment system to safely arrest the fall.

## Changes to the Safe Work Procedure

Employers must designate a competent person to approve changes to the Safe Work Procedure. The competent person must review the safe work procedures as the job progresses and determine if additional practices, procedures, or training need to be implemented.

In the event of a fall or other serious incident, the employer must ensure the hazard and risk assessments are re-evaluated to ensure additional control measures are implemented.

**Reminder:** all serious incidents as defined in Part 2 of the workplace safety and health regulation must be reported to the Workplace Safety and Health Division.

Employers must notify and train workers if new procedures are implemented. Documented training records must be available for all persons engaged in the activity.



## Site Specific Safe Work Procedure Interpretation

Fall protection safe work procedures need not be singularly site specific for residential construction but must apply to the site and structure, and contain only applicable information. However, a unique site and or structure will require a site specific safe work procedure.

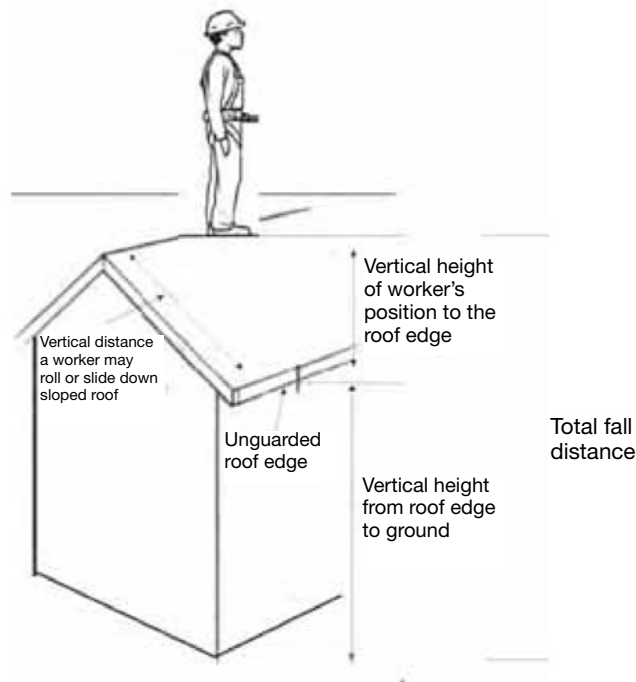
For residential construction, the requirement for site specific fall protection safe work procedures allows a residential builder who builds almost identical structures on multiple sites to have one, two or several standardized safe work procedures for many structures. An all-encompassing, “canned” safe work procedure, containing material that does not apply to the structure under construction, is not acceptable.

## Determining The Fall Distance

The 3 metre fall distance is measured from the point on the platform, stair, working surface etc. from which a worker may fall, usually measured from the worker’s feet, to a lower level. Lower levels include, but are not limited to, those areas or surfaces to which a worker can fall such as ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment or structures.

On a sloped roof, the 3 metre fall distance is measured in two ways:

- (1) if the worker is upslope from the eave and more than 2 metres (6.5 ft) away from a gable end**, the fall distance is measured from the top of the eave to a lower level. Lower levels include, but are not limited to, those areas or surfaces to which a worker can fall such as ground levels, floors platforms, ramps, runways, excavations, pits, tanks, material, water, equipment or structures. The vertical height from the workers position to the unguarded roof edge must be added when on a roof with a slope greater than 4 vertical in 12 horizontal (4:12 pitch).



- (2) **if the worker is within 2 metres (6.5 ft.) of a gable end at any point upslope of the eave**, the fall distance is taken as the vertical distance from the worker's feet to a lower level. The assumption here is that the fall hazard is the worker falling off the gable end – the worker is much less likely to roll or slide down to the eave and then lose contact with the roof.

In the case of multi-level sloped roofs, if a worker falls from one level to the next, a distance of 3 metres (10 ft.) for example, and then continues to fall to the next level, an additional 2.5 metres (8 ft.) for example, the need to provide fall protection is based on the overall fall distance of 5.5 metres (18 ft.). The sloped roof onto which the worker falls is not considered to be a safe lower level (i.e. one from which a further fall would be prevented).

## Procedure Based Fall Prevention Controls

This section allows the use of another control measure considered by the Director (A.D.M.) of the Workplace Safety & Health Division. This system involves the use of administrative procedures, in the limited number of situations only described below, subject to specific conditions. A procedure-based fall prevention control can only be used in the following situations, where workers are exposed to fall hazards for very short periods of time, not more than 20 minutes:

- (1) **installation or removal of fall protection equipment (first person up/last person down)** – typical examples may involve installing a fall arrest anchor at the peak of a roof, and removal of fall protection anchors.
- (2) **roof assessment or estimating** – applies to both flat and sloped roofs. Roof assessment includes school staff checking for and retrieving items that have been thrown on a school roof; insurance estimators; roof repair estimators, etc.
- (3) **emergency repairs** – this does not include normal maintenance and service tasks. Emergency repairs must involve light duty tasks of short duration, not more than 20 minutes.

**If an employer wishes to use a procedure-based fall prevention system, all of the following conditions must be met:**

(1) **Documented Hazard Assessment**

A written hazard assessment specific to the work site and work being performed must be completed as required under Section 4(2)(c) of the Act.

(2) **Documented Safe Work Procedures**

The procedures must be documented and effectively communicated to workers before the work begins, and followed by workers while performing the work. Workers must be trained in the safe work procedures and understand the activity they are about to undertake. The procedure based controls must be part of the safe work procedures required by Part 14.2(1) of the workplace safety and health regulation and the fall protection safe work procedures outlined on page 54 of this guide.



### **(3) Fall protection system must be used where practical**

If the use of a fall protection system such as:

- (a) a guardrail
- (b) a safety net
- (c) a travel restraint system,
- (d) personal fall arrest system,
- (e) a warning barrier / control zone

is practical, it must be used (ex. if anchor points are available or a fall protection system can be rigged without exposing workers to a greater hazard, then a fall protection system must be used). The option of using a procedure based system is not intended to allow an employer or worker to avoid using a fall protection system or some type of elevated work platform just because doing so may be inconvenient or take more time than using an administrative procedure.

### **(4) Limit number of workers exposed to fall hazard**

The work must be carried out in such a way that minimizes the number of workers exposed to the fall hazard while work is performed.

### **(5) Limit worker exposure to undue harm**

Use of a procedure-based control must not expose a worker to undue harm.

Working at height has inherent risks. Undue harm involves exposing a worker to greater potential harm and is not an acceptable practice (ex. having a worker free- climb a steeply sloped metal clad roof to install an anchor at the peak, or having a worker inspect a difficult-to access equipment location that could be inspected from another location using other means such as an elevating work platform).

The work must not expose workers to undue hazards resulting from poor environmental conditions (ex. high winds, icy footing, roof slope, or surface finish).

### **(6) Light duty tasks of short duration**

The work must be limited to light duty tasks of short duration. As with work performed from a portable ladder, certain conditions apply:

- (a) the work must be a "light duty task" such as inspection, estimating, or simple emergency repairs (ex. membrane repair on a flat roof, shingle repair, etc.). The repair of insulation below the waterproofing membrane is not a light duty task.  
The work done must be completed within 20 minutes, and
- (b) while doing the task, the worker should not turn his or her back to the edge and must keep the edge in sight. If either of these conditions cannot be met, a procedure-based control cannot be used.

### **(7) Worker competency**

The worker performing the work must be trained and knowledgeable in the task.

### **(8) Limitations on roof assessment/estimation activities**

If the procedure-based approach is used for assessment/estimation activities, the activities must take place prior to the actual start of work or after work has been completed. If the activities take place while work is going on (ex. during construction of a roof or structure), the fall protection requirements under Part 14 of the workplace safety and health regulation apply to all workers exposed to a fall hazard.

A procedure-based fall prevention control meeting the listed conditions and applied to the three situations described earlier i.e. (1) installation or removal of fall protection equipment; (2) roof assessment or estimating; and (3) emergency repairs, are activities that will be considered by the Director of Workplace Safety & Health Division for a variance of Part 14 of M.R. 217/2006

## Site-Specific Fall Protection Requirements

### Working on top of foundation walls and formwork

Workers pouring concrete are required to be in close contact with the distribution chute of the concrete pumper truck. Walking along the top of the form is not acceptable practice; work platforms and scaffolds are recommended to be used.

Work platforms (engineered bracket scaffolds) are made of planks resting on metal brackets that hang from the wall forms.

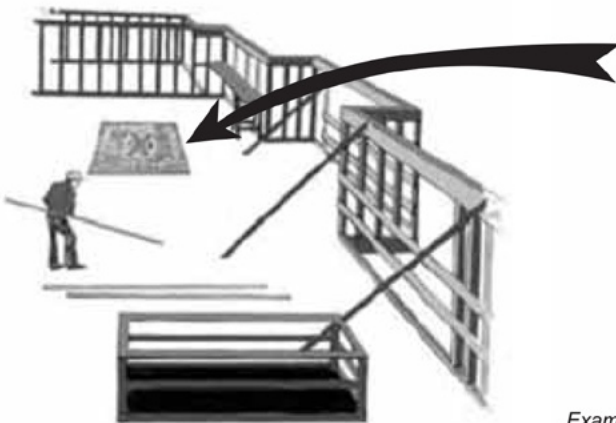
These platforms must be at least 500mm, 2 -2x10 planks. Planks should overhang the brackets by between 150 mm and 300 mm (6 to 12 inches); have cleats to prevent slipping; and have guardrails (top rail & mid rail) if the platform is over 3m (10 ft) high.

Safe access must be provided to all work platforms. If ramps are used they must meet the regulatory requirement (600mm in width, 1:3 slope, securely fastened in place, supported, cleated, clear of snow & mud accumulation, and when the ramp is placed over a trench it must have hand rails securely fastened in place). Ladders can also be used as an alternate form of vertical access.



## Working on unsheathed floor joists

- A misstep is likely to cause a fall to the level the worker is standing or walking on, or possibility through the floor joists.
- Do not walk on the top of the wall to place the beams. The first floor joists or trusses should be placed into position and secured either from the ground, ladders, safe work platforms or scaffolds.
- When stacking materials on joists, make sure to distribute the load evenly and near locations of solid support.
- Use a work platform to install blocking / bridging from below before putting sheathing on joists.
- Except for the first row of sheathing, which must be installed from the ladders or the ground, workers must work from an established deck.
- After the first row of sheathing is installed, erect guardrails or place anchor points in appropriate locations for employees to use personal fall-arrest systems while completing the decking operation.
- A sheet of plywood acts like a sail in windy environmental conditions. A gust of wind may take it and you over the edge. If wind gusts exceed 35 kilometers per hour, sheathing operations must cease.
- Fall hazards increase when a worker moves near the perimeter of the structure or near a large floor opening. Floor and roof openings through which a worker could fall must be securely covered or have guardrails erected around them. Ensure floor openings are covered, secured and well marked. Cover floor openings securely and identify them clearly. Ensure all exterior walls have guardrails.

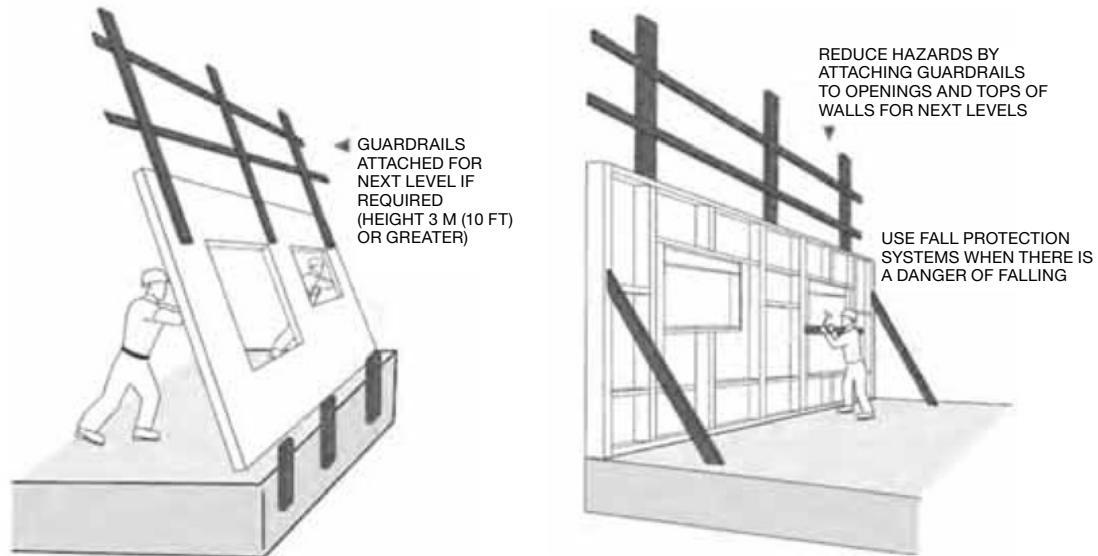


*Example of markings on a plywood cover.*



## Erecting Second Story Exterior Walls

**Guardrails:** This method requires workers to attach guardrails to the main floor walls before they are erected. Use a  $\frac{1}{2}$  -  $\frac{3}{4}$  inch shim between the guardrail and the wall. This forces the guardrails onto a slight angle which allows the 2nd story walls to be erected without interfering with the attached guardrail. Once the main floor walls have been secured in place the second story guardrails will also be in place. Remember, when it's windy, lifting walls can be dangerous. The wind can blow an entire wall section on top of you, or blow you and the wall over the edge. When wind gusts exceed 35 kilometers per hour, alternate control measures may be required to eliminate the risk of worker injury.



**Warning barriers / control zones:** This system must be delineated 2 m. (6.5 ft) from all perimeter sides of the structure (see page 58, 59 Work Near A Roof Edge: Warning barriers / controlled access zones). A control zone **cannot** be used if the level working surface on which work is being performed is less than 4 metres (13 feet) wide. In such circumstances, one of the other methods of fall protection required by the fall protection guide must be used.

Employees must be trained so that they can work inside these lines without fall protection. However, when work is required outside of the warning barrier, a travel restraint system is required. An example would be where most of the wall being built would be inside the control zone but one employee would be responsible for nailing the bottom plate. That employee will be outside the control zone and would be required to use a fall protection system. The bottom plate should be toe nailed for stability while raising the wall.



The wall would be raised using 2x4 boards nailed to the sides of the walls. Once the wall is erected the boards used to raise the walls would be nailed to the floor to brace the wall while the bottom plate is being nailed into the floor.

**Fall protection (travel restraint or fall arrest):** where guardrails or warning barriers can not be used, travel restraint or fall arrest equipment must be used. At no time is it considered acceptable to work without the use of some type of fall protection system.



After all exterior walls are raised and braced; the window and door openings that are less than 0.9 m (36 inch) from the floor must have guard rails installed at the appropriate height (this may be done while the wall unit is on the floor). Any large openings such as stairwells, atriums, etc. should have permanent walls installed and/or guardrails built.

This process continues until all exterior walls are erected and then the walls will act as fall protection for employees.

**Setting Roof Trusses:** The safest method of truss installation involves building all or part of the roof on the ground, then hoisting it into place. This is the safest method for truss installation. If your construction project site has the space available for this type of installation, building the roof on the ground should be considered the first method of choice.

If space limitations do not allow for building on the ground first, placing each truss individually or in a bundle on top of completed wall framing is another method that can be used. Trusses must be spread and erected from scaffolding placed inside or outside the exterior walls of the building.

Before placing trusses, make sure that all floor openings are covered and that walls are braced as required. Remember: **Never stand or walk on the top plate without fall protection.**



Conventional scaffolding, wood scaffolding or engineered bracket scaffolds that hang off the top plate are some examples of work platforms that can be used. Bracket scaffolding, when designed and manufactured correctly, provides a platform and guardrails that comply with the regulations. The platform shown on the next page not only protects the workers from falls - it also reduces back strain by positioning the work at waist level instead of at the feet. Install a temporary platform down the centre of the house to give workers a better position to spread and stand up the trusses. A designed, job-built platform or a frame scaffold system can be used.



Wood scaffolding:



Bracket scaffolding:



The truss system is designed to operate as a complete system, therefore utilization of a truss as a personal fall arrest system attachment point before the system is complete could lead to truss failure/collapse, and result in injuries.

***Note: Truss manufacturers state that all permanent bracing has to be installed for the system to be structurally sound. Therefore, prior to using the system for fall arrest anchor, all permanent braces must be installed in accordance with the truss manufacturer's specifications.***

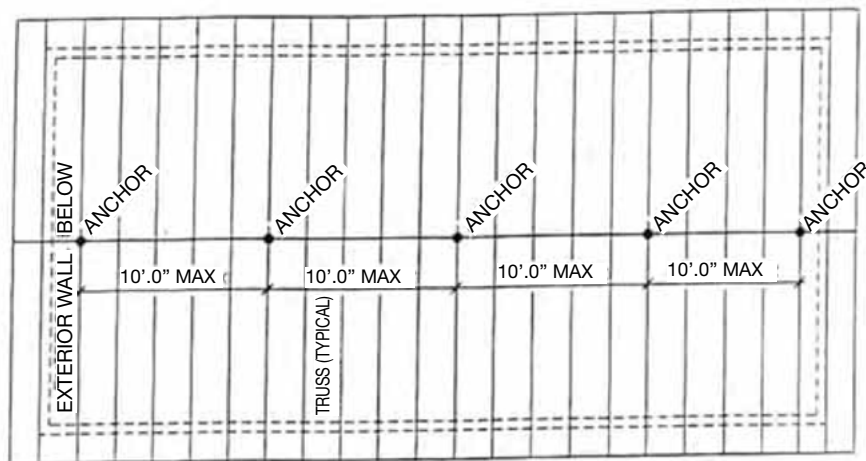
All fastening of trusses to wall top plates must be performed from approved scaffolding inside or outside the walls or from ladders. No worker is allowed to stand on the top plate of the wall. After the last truss is installed, all permanent bracing must be installed prior to starting the sheathing of the roof.

After the permanent bracing is installed, the first row of sheathing must be installed from wall scaffolding or other safe means including scaffolds, elevated work platforms, etc.. Once the first course of sheathing is installed, the truss system can be utilized for personal fall arrest system attachment points. Fall arrest systems must be used for all remaining work on the roof (sheathing, shingling, eaves trough installation, etc).

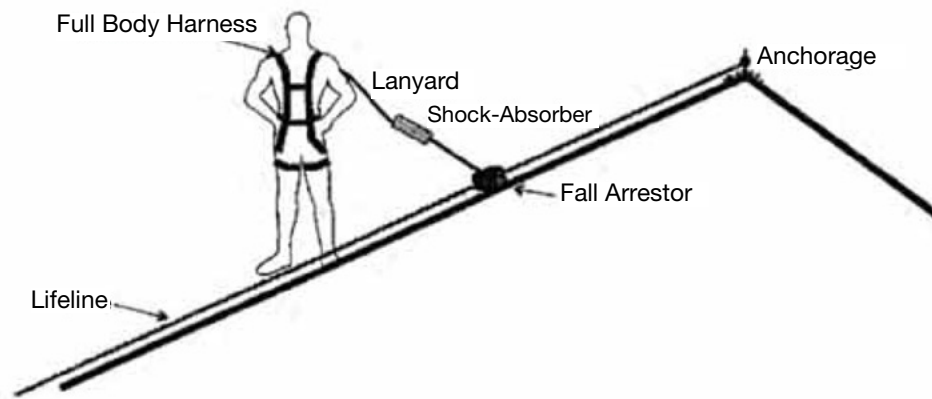
Piggy-back trusses can only be installed after the main roof structure is complete, including all permanent bracing and sheathing. Piggy-back trusses must be installed utilizing fall arrest systems.

It is strongly recommended to secure anchor systems, such as “snappy strap/ roof bracket” on the fifth truss for a tie off before it leaves the ground and others (at 10 foot intervals) as necessary throughout the house. Most probable locations are the centre truss and fifth from the end.

Example of placement of anchors on a gabled roof:

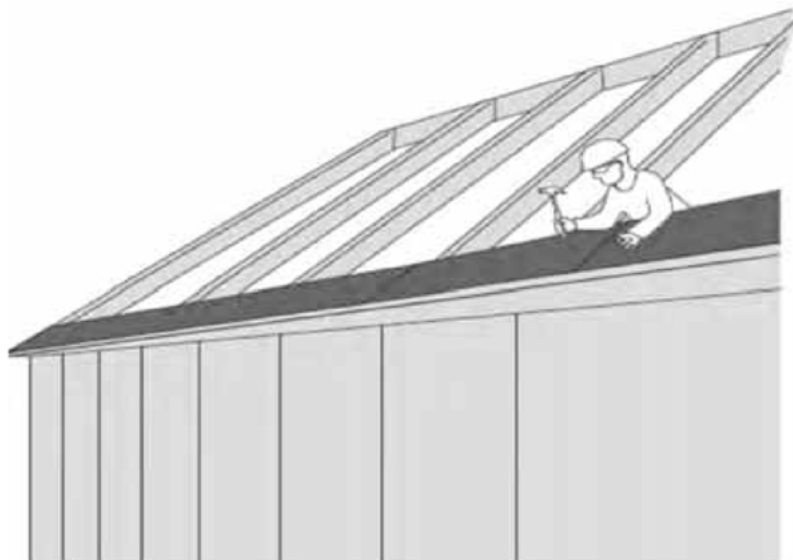


Fall arrest system secured to an anchor point on a sloped roof



## Installing Roof Sheathing

After all trusses have been installed and braced according to manufacturer's specifications, install the first row of sheathing from the interior / exterior scaffolding. Once the first row of sheathing has been installed work can continue from the roof.



You must ensure 100% fall protection for the remainder of the sheathing process. The first choice of fall protection for sheathing should be guardrails. If this is not possible a fall arrest system must be used. The fall arrest system for sheathing includes a full body harness, shock absorbing lanyard, rope grab, lifeline and anchor. Tie off to anchors on the roof such as ridge brackets or straps. These anchor systems should have been installed during the truss installation. If there are no anchors in place, a competent worker must install the anchors. All anchor points and life lines must be installed across the peak of the roof before commencing sheathing. All lifelines must extend to ground level. When moving from one anchor point to the next, approach the next lifeline, hold both lifelines together, remove rope grab from one and re-connect to the next, or use a "Y" lanyard and tie off to the next before unhooking from the last.

To minimize swinging in case of a fall, ensure the lifeline is no more than 15 degrees to each side of the anchor point.

Attach the rope grab to the life line and climb the ladder to access the roof area. Work from the first row of installed sheathing and continue to complete the roof sheathing requirements.

It is highly recommended leaving the anchor points (only if using anchor straps) for the roofer and other trades who require access to the roof area to complete their work.

Air lines and extension cords are always slip and trip hazards. But on a sloped roof, even a minor slip can lead to a fall. Rather than running cords and lines across the roof, bring them up from directly below the work area. Don't let sheathing lie loose on the roof. Fasten sheets as soon as you place them.

In cold or wet weather - and especially on frosty mornings - wood surfaces can be very slippery. Even though you are secured by your fall protection system, a slip can still injure you. Take care and move cautiously. During times of snow fall, ensure the roof area is swept off on a regular basis to reduce slippery surfaces.



## Sloped roofs

Devices such as slide guards (toe boards / roof jacks) and approved ladders with roof hooks are considered helpful on sloped roofs where foot traction is inadequate. They are not considered adequate substitutions for fall protection systems but can be used in addition to fall protection while working on sloped roofs.

## Shingling

Shingling on all construction projects requires 100% fall protection. Workers must tie off to anchors on the roof such as ridge brackets or straps. If there are no anchors in place, a competent worker must install all anchors and lifelines across the peak of the roof before starting work. When moving from one anchor point to the next, approach the next lifeline, hold both lifelines together, remove rope grab from one and re-connect to the next, or use a “Y” lanyard and tie off to the next before unhooking from the last.

To minimize swinging in case of a fall, ensure your lifeline is no more than 15 degrees to each side of your anchor point.

Attach the rope grab to the life line and climb the ladder to access the roof area. Air lines and extension cords are always slip and trip hazards. But on a sloped roof, even a minor slip can lead to a fall. Rather than running cords and lines across the roof, bring them up from directly below the work area. Don't let sheathing lie loose on the roof. Fasten sheets as soon as you place them.

In cold or wet weather - and especially on frosty mornings - wood surfaces can be very slippery. Even though you are secured by your fall protection system, a slip can still injure you. Take care and move cautiously. During times of snow fall, ensure the roof area is swept off on a regular basis to reduce slippery surfaces.





## Soffit, Fascia, Eaves Troughing and Siding Application

The installation of soffit, fascia, eaves troughing and siding may require unique fall protection applications. Ladders should be used for short-term work only and should never be used for installing large pieces of siding, eaves troughing, etc. as workers are unable to maintain 3 point contact when climbing the ladder.

Ladder jacks, pump jacks, scaffolding or elevated work platforms should be considered the safest method for installation of soffit, fascia, eaves troughing or siding.



*Unsafe practice.  
Difficult to coordinate movements  
and impossible to maintain  
3-point contact.*

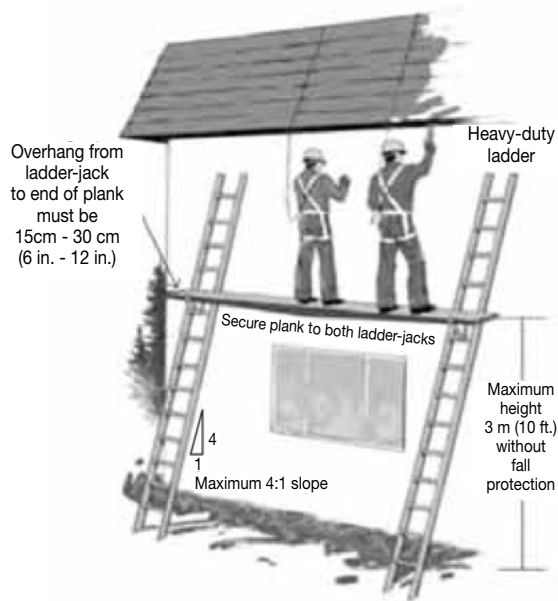
All four of these applications require either guardrails or travel restraint when working above 3m meters or when working over hazardous substances or materials.

Pump-jack scaffolds provide a safe, stable work platform, but you must follow the manufacturer's instructions on inspection, installation, and use.

When using ladder jack scaffolds, make sure that ladders used are properly set up: the base must be 1 foot out for every 3 to 4 feet up. Both ladder feet must rest firmly on the ground and the top side rails must rest firmly against the building. Ladders must also be secured in place to prevent lateral movement and to prevent the ladder from sliding out at the bottom. If the ladder rocks, it's not safe. Ensure the jacks rest on both the side rails and the ladder rungs, or the ladder rungs only, but only if the bearing area of each rung is at least 254 mm (12 in.). Ladders should not be spaced more than 2.5 m (8 ft.) apart and can not be used more than 5 m (16 ft.) above grade. Work platforms must be 500 mm (20 in.) wide.

To access the platform , use a ladder that is properly set up and secured.





*Fall protection is required on ladder-jacks over 3 m (10 ft.).*

Make sure the scaffold has suitable guardrails at each end and at the open side of the platform. If there are no suitable guardrails, workers must be provided with, and use, fall protection that includes anchor points secured to the house.

Reminder, if powered elevating work platforms are used, workers must be trained to operate the class of equipment they will use. If elevating work platforms are equipped with anchors, travel restraint protection must be worn while operating the equipment.

*A powered elevating work platform lets you lift material, reach the work area efficiently, use both hands for installation, and keeps you from falling.*



## Working alone in residential construction

On homebuilding sites, trades-people are sometimes required to work alone or in isolation.

A worker is considered to be working alone when the worker is:

- the only worker for that employer at that workplace; and
- not directly supervised by the employer or another person designated as a supervisor.

Working in isolation means working in circumstances where assistance is not readily available in the event of an injury, illness or emergency.

If workers are required to work alone or in isolation, employers must:

- identify all risks to workers and take steps to eliminate or reduce those risks;
- develop and implement safe work procedures:
  - train workers in those procedures and ensure they comply,
  - include an effective communication system as part of the safe work procedures,
  - provide emergency supplies to the worker (ex. under extreme cold or other inclement weather conditions, etc.) where the need is identified,
  - post a copy of the safe work procedures in a visible location at the workplace, and
  - review and revise the procedures regularly

See the Workplace Safety and Health Division's Code of Practice for Working Alone or in Isolation, and Part 9 of the workplace safety and health regulation for detailed requirements.

## Have a plan in case of an emergency

Part 14, section 14.2 (3 )(c) of the workplace safety and health regulation requires documented rescue procedures to be in place for use, in the event a rescue is attempted to retrieve a worker after a fall has been arrested.

The suspended worker faces several problems:

- (1) the worker is suspended in an upright posture with legs dangling;
- (2) the safety harness straps exert pressure on leg veins, compressing them and reducing blood flow back to the heart; and
- (3) the harness keeps the worker in an upright position, regardless of consciousness.

Rescue must happen quickly to minimize the dangers of suspension trauma. Time is of the essence because the suspended worker may lose consciousness in as few as five minutes. There are two ways in which a worker may be rescued:

**Rescue** – this is a simple rescue plan. In this situation the worker has fallen and is hanging from a fall protection system and must not have suffered any type of injury. Equipment that may be used to reach a suspended worker and get them down quickly include: nylon or rope rescue ladders, extension ladders, man-lifts, elevating work platforms, etc.

Ensure that you have a means of communication in the event of a fall. If you are using a cell phone as part of your rescue plan ensure that it is placed in an area where it will be accessible. When a fall occurs, straps across the groin area will prevent a worker from accessing their front pockets.

**Injured Casualty Rescue** – In this situation the worker has fallen, is hanging from a fall protection system and has suffered an injury that makes a self-rescue impossible. These types of rescues may need specially trained and equipped personnel. This type of rescue requires a much wider selection of equipment and is much more difficult and complex to perform. In extreme cases, the fire department may use aerial ladder trucks, high-reach equipment or rappelling techniques to reach trapped workers and lift or lower them to a safe level.

Rescue plans should cover the on-site equipment, personnel, and procedures for different types of rescue. Any off-site rescue services that might be required should be contacted and arranged in advance to familiarize them with the project.

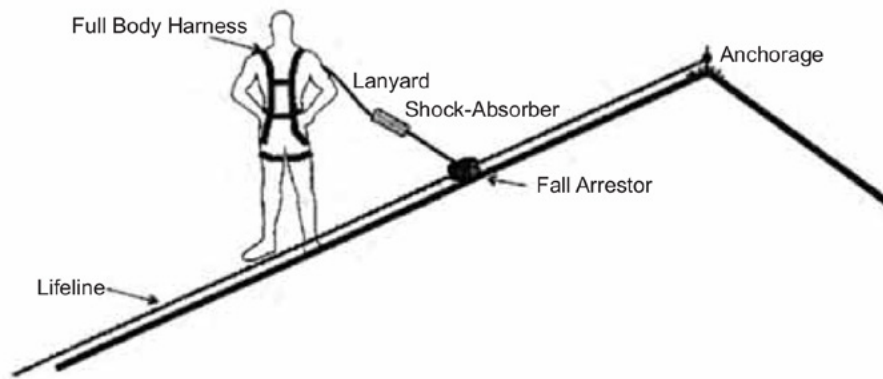
Site management must ensure that:

- Everyone on site is aware of the rescue plan
- Equipment and other resources are available
- Designated personnel are properly trained.

## Residential roof work

Part 31, Division 1 of the workplace safety and health regulation also applies to residential construction projects.

### Example sloped roof fall protection system.



# DEFINITIONS

**Anchorage** – a permanent structure or part of a structure designed to withstand any fall arrest forces imposed on it.

**Anchorage Connector** – a component or subsystem that attaches either permanently or temporarily to an anchor, and that provides flexible and functional connection to the rest of the PFAS systems and subsystems when anchor by itself would not.

**Automatic descent control device** – a device that, once engaged, lowers the user at a constant speed. The user has no ability to stop or control the rate of descent.

**Body Belt** – a body support device that encircles the body at or about the waist.

**Body-holding device** – a device intended to support the weight of an individual in the event of a fall. It is also designed to prevent or minimize injury to the individual resulting from the forces placed on the body during arrest of the fall and subsequent suspension. Body-holding devices may also be designed to support an individual's body weight during the use of a descent control or work-positioning device, or to function as part of a work restraint system.

**Connector** – a component or element that is used to couple parts of a system together.

## **Connecting Components (connectors) -**

**Carabiner** – a Class I connecting component that generally consists of a trapezoidal or oval body having a self-locking feature that may be opened to permit the body to receive an object and that, when released, automatically closes and locks to prevent inadvertent opening.

**D-Ring** – a connector used integrally in a harness as an attachment element or fall arrest attachment, and in lanyards, energy absorbers, lifelines, and anchor connectors as an integral connector.

**O-Ring** – a circular connector

**Oval-Ring** – an oval connector

**Self-locking connector** – a locking type connector with a self-closing, self-locking mechanism that remains closed and locked until intentionally unlocked and opened for connection or disconnection

**Snap hook** – a Class I connecting component that consists of a hooked-shape body having a self-locking and self-closing feature that may be opened to permit the body to receive an object and that, when released, automatically closes and locks to prevent inadvertent opening. Snap hook connectors also have an integral closed eye, either fixed or swivelling, to be permanently fastened to a subsystem.

**Descent control device** – a device that is designed and intended to be used and operated by one person for personal descent or to lower another person from an elevation. A descent control device may be used either for egress or for work positioning, or both.

**Emergency egress** – an evacuation from a location in the event of emergency. From an elevated location, emergency egress may require controlled descent.

**Emergency egress body-holding device** – a body-holding device that is manufactured for integral connection to a Type 1E or Type 2E descent control device.

**Energy absorber** – a component or element that is included as an integral part of an SRD that dissipates kinetic energy and limits deceleration forces during a fall.

**Full body safety harness** – a device, meeting the requirements of CSA Standard Z259.10, that is made primarily out of straps for containment of the torso and pelvic area (and optionally the waist area), and that is designed to support the user during and after the arrest of an accidental fall and/or during a rescue operation and/or during work activities, depending on the group classification of the harness.

**Fall Arrest System (FAS)** – a series of components that, when used properly together, will come into service and arrest a worker's fall.

**Fall Restricting Equipment (FRE)** – a component of a fall restrict system (e.g. modified pole strap, rigid but articulated frame, or other such devices) that, when combined with other sub-components and elements, allows the climber of a pole to remain at his or her work position with both hands free and that performs a limited fall arrest function when contact is lost between the climber's spurs and the pole.

**Fall Restrict System (FRS)** – a combination of a work positioning system (WPS) and FRE.

**Hardware** – connecting components constructed of solid rigid materials such as metals or other types of composite materials, as opposed to connecting components manufactured by such means as stitching, rope splicing, swaging, and heat fusion. See CSA-Z259.14 Fall Restrict System for Wood Pole Climbing for further information.

**Integral** – not removable from any component, subsystem, or system without mutilating any of its elements or using a special tool.

**Lifeline** – a flexible line or rope made of synthetic fibre, wire or webbing that is attached to an anchor point at one end and along which a fall arrestor travels.

**Manual descent control device** – a descent control device that gives the user control over the rate of descent and the ability to stop the descent. Manual descent control devices are subdivided into two further categories: those which have automatic lockoff features and those which do not.

**Saddle** – a device between the knees and buttocks that, with an integral belt, supports the body and is used for work positioning or suspension.

**Self-retracting device (SRD)** – a device that performs a tethering function while allowing vertical movement (below the device) to the maximum working length of the device, which will arrest a user's fall. An (SRD) has housing, normally attached to the anchor of FAS that contains a drum-wound lifeline. The retraction end of the lifeline will unwind from the drum under slight tension during the normal movement of the user below the device. When tension is removed, the drum will automatically retract the lifeline. Quick movement such as is typically applied in a fall will lock the drum, arresting the user's motion. The SRD is designed to arrest a fall while minimizing fall distance and impact force.



**Self-retracting lanyard – Type 1 (SRL)** – an SRD which is short in length e.g. 1.5m (5 ft) to 3.0 m (10 ft) working length. It is compact and lightweight, allowing attachment of the housing to the body support. The SRL's internal locking mechanism is not capable of absorbing significant amounts of energy. Like a standard lanyard, an SRL subjected to the force of a fall must be retired from service.

**Self-retracting lanyard – Type 2 (SRL)** – an SRD which is generally long in length (greater than 3.0 m (10 ft) working length). The larger SRL is typically too heavy to attach to the body support. It has an internal shock-absorbing mechanism that works with the brake to minimize impact forces. The SRL must have a visible load indicator. It is repairable after a fall incident and is subject to a manufacturer's service schedule.

**Self-retracting lanyard with retrieval capability – Type 3 (RSRL)** – an SRD which will perform a fall-arrest function as a Type 2 device. When a user becomes incapacitated as a result of a fall or other incident, a Type 3 device will allow a single attendant to raise or lower the casualty to a safe level. Type 3 devices must meet all the criteria for Type 2 devices as well as Type 3.

**Single attachment point (dynamic attachment component)** – a Class I connecting component that is an integral part of a PFAS system or subsystem, and that is designed to connect related subsystems together and/or to connect the system to an anchor or an anchor connector.

**Single attachment point** – a Class II connecting component used for work positioning, descent, rescue, and other such purposes not involving fall arrest.

**Travel Restraint System (TRS)** – an assembly of components that, when properly assembled and used together and when connected to a suitable anchor, prevents a worker from approaching and reaching an unprotected edge or opening where a fall could occur. A TRS is not intended for use as a work positioning system or FAS. A full body safety harness connected to a suitable lanyard and anchor is an example of a travel restraint system.

**Work Positioning System (WPS)** – an assembly of components that, when properly assembled and used together, supports a worker in a position or location so that the worker's hands are free in the work position. A WPS is not intended for use as FAS. Note: A lineman's body belt or harness, or both, in addition to a pole strap and spurs, constitute a work positioning system for climbing and working on a pole.

**Visual load indicator** – a component of an SRL that allows the field operator to determine when the device has arrested a fall.

**Working length** – the effective extended length of an SRD from the load-bearing point on the housing (Type 2 (SRL) or housing connector (Type 1 (SRL), to the load-bearing point on the bottom connector.

**Work positioning** – supporting a user in a position or location in which he can do his work, (ex. a worker on a utility pole).





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