

Fall Protection Program

OCCUPATIONAL HEALTH & SAFETY

Revision Date: January, 2017

DEFINITIONS

Anchor - a secure point of attachment for lifelines or lanyards that is capable of withstanding the loads:

fall restraint - 800 lbs.

fall arrest - 5000 lbs.

Control zone - the area between an unguarded edge and a defined line which is set back a safe distance. (Minimum 2 m or 6 1/2 ft)

Exceptional Hazard - an additional hazard over and above the normal hazard of falling to the surface below, for example, falling onto a moving conveyor or onto protruding reinforcing steel.

Fall distance - the distance from the point where the worker would fall to the point where the fall would be arrested. (Maximum of 4 ft. without a shock absorber, 6 1/2 ft. with a shock absorber)

Fall arrest - stopping a fall which has occurred before the worker hits the surface below.

Fall Restraint - the use of a work positioning system to prevent workers from falling from the position in which they are working or a travel restriction system to prevent workers from travelling to an edge from which they may fall.

Free Fall - The distance from the point where the worker would begin to fall to the point where the fall arrest system begins to cause deceleration of the fall.

Full body Harness - a configuration of connected straps to distribute a fall arresting force over at least the thigh, shoulders and pelvis, with provisions for attaching a lanyard, lifeline or other components.

Horizontal Lifeline - a rail, wire rope or synthetic cable that is installed in a horizontal plane between two anchors and used for attachment of a worker's lanyard or lifeline while permitting the worker to move horizontally.

Fall restraint - ultimate load capacity of at least 800 lbs. per worker

Fall arrest - certified by a professional engineer

Lanyard (energy absorbers) - a flexible line of webbing, rope, or cable used to secure a safety belt or full body harness to a lifeline or anchor.

Lifeline - a line from a fixed anchor or between two horizontal anchors and used for attachment of a worker's lanyard, safety belt, full body harness or other device.

National Standards of Canada (NSC): Organization that standardizes the development and application of standard publications that establish practices, technical requirements and terminologies for products, services and systems.

Personal Fall Protection System - a fall protection system which uses a safety belt or full body harness to secure each worker to an individual anchor by means of lanyards, vertical lifelines, or other connecting equipment.

Safety Belt - a body support component comprised of a strap with a means for securing it about the waist and for attaching it to other components. Used only for fall restraint systems.

Shock absorber - a component whose primary function is to dissipate energy and limit deceleration forces which are imposed on the body during fall arrest. With a shock absorber in place a free fall of 6 1/2 feet is permitted in a fall arrest system.

Swing Fall Hazard - the hazard of swinging and colliding with an obstruction or the ground following a fall by a worker connected to a lifeline at an angle to the anchor location.

Work Procedures - the prevention of fall injuries by the control zone or safety monitor systems under this system or other systems established by an employer to minimize the risks from not using a fall protection system.

Orthostatic Hypotension: In suspension trauma, this refers to the pooling of blood in the leg veins of a worker that occurs when individuals fall in harnesses, are suspended in confined spaces, etc. and are forced to hang vertically with their legs relaxed (immobilized).

Reflow Syndrome: The return of pooled, hypoxic blood and its metabolic byproducts from the extremities to the heart (more about this later).

Rescue Death: When related to suspension trauma, this type of death occurs in patients who appear physiologically stable during the rescue and extrication but suddenly die after being freed.

Suspension Trauma: Injuries Sustained from being immobilized in a vertical position when the legs are relaxed and immobile. Injuries include hypoxia (insufficient oxygen reaching the tissues); syncope (loss of muscle strength and/or fainting); hypoxemia (abnormally low levels of oxygen in the blood causing shortness of breath); acidosis (excessive acid in the body fluids or tissues, build up to CO₂); ventricular fibrillation (irregular contractions of the heart where the chambers quiver uselessly instead of pumping blood, generally followed by sudden cardiac arrest); myocardial infarction (heart attack or literally “death of heart muscle”); damage to the liver, kidneys and brain; and possibly death.

Suspension Syndrome: The condition in which a suspended person becomes unconscious due to orthostasis (upright hanging position) *without* traumatic injury

PREAMBLE

Employers are required to ensure that all workers that perform tasks while working at heights are provided with the proper training, equipment and supervision. As a result of a steady increase falls from heights in the workplace over the past several years, the Chief Prevention Officer of Ontario revised the working at heights training requirements to include very specific training requirements for workers, by approved training provider and materials.

This training, under O. Reg. 297/13 and 213/91, Sec. 26.2(1), must be conducted by April 1st, 2017.

PURPOSE

Falls are the leading cause of critical injuries and deaths of workers in Ontario. Falls from heights accounted for almost 29% of fall-related injuries and work-related deaths.

(Stats courtesy of: <https://news.ontario.ca/mol/en/2016/06/blitz-targets-workplace-falls.html>, June 3rd, 2016)

Workers are at increased risk of falling due to:

- A lack of training on fall hazard identification
- A lack of adequate training for the task
- A absence of proper equipment
- The lack of proper barricades to prevent falls
- Improper access to elevated work areas

RESPONSIBILITIES

Employer Responsibilities

Ensure a written Fall Protection Program is in place

Ensure that safe work practices have been developed for individual tasks

Ensure supervisors and workers are trained.

Ensure that a fall Protection System is being used.

Ensure that guardrails are used when practicable.

Ensure a Fall Restraint system is in place when applicable.

If a Fall Restraint cannot be used, ensure a Fall Arrest system is in place.

Provide appropriate Control Zone procedures if the above are not appropriate.

Ensure all equipment is safe, maintained, inspected and used correctly, including ladders, stands and platforms.

Risk assessment of fall hazards is done prior to work commencing

Review the program annually.

Supervisor Responsibilities

- Review the Fall Protection Program.
- Investigate any hazards or potential hazards and make recommendations to prevent injuries.
- Advise workers on any existing or potential hazards and ensure workers are

following the program.

- Ensure workers work in a safe manner, and according to their training.
- Keep records of all workers trained for the fall protection program
- Ensure all workers affected, read and have a copy of the fall protection program.
- Ensure that all workers are provided with the appropriate equipment.
- Ensure all workers inspect, maintain, and use the equipment in the recommended methods.
- Enforce all Fall Protection Procedures.

Worker Responsibilities

- Review the Fall Protection Program.
- Follow all Fall Protection Program procedures.
- Perform work as per the training.
- Inspect and maintain all Fall Protection equipment.
- Report any hazards or potential hazards to supervisors.
- Ensure the equipment is used and stored as the manufacturer recommends.

APPLICABLE LEGISLATION

Under the construction regulations (Ontario Reg. 213/91) and the Industrial regulations (Ontario Reg. 851/90), components of a fall protection system must meet applicable National Standards of Canada standards. Most of the CSA standards require that components be labeled or marked to indicate their standard of compliance.

Always use equipment that meets these requirements. Look for the following CSA standard numbers attached to or etched on components:

- Shock absorbers - CAN/CSA Z259.11
- Self-retracting devices - CAN/CSA Z259.2.2
- Descent control devices - CAN/CSA Z259.2.3
- Fall arresters (rope grabs) - CAN/CSA Z259.2.1
- Vertical lifelines when sold in bulk on a reel or container –CSAZ259.2.1 on the container or reel.

Standards for the following devices don't require marking, but most reputable manufacturers mark them anyway:

- Harnesses - CSA Z259.10
- Safety belts - CSA Z259.1
- Lanyards - CSA Z259.11

If any of these devices are not marked, ask the manufacturer for evidence that it meets the requirements of the applicable CSA standard.

WARNING:

Do not use any fall protection components labeled, etched, or otherwise marked with a CSA standard number different from those noted above. Such components do not meet the requirements of current regulations.

LADDERS

Portable ladders are one of the handiest, simplest tools we use. Because of their effectiveness, ladders are to perform a variety of tasks. Although ladders are not a complicated piece of equipment, planning and care are still required to use them safely. Accidents occur when worker use damage ladders or in ways that they were not intended. Poor work practices or instruction, and lack of training increase the risk of accidents and injuries.

WHEN TO USE A LADDER

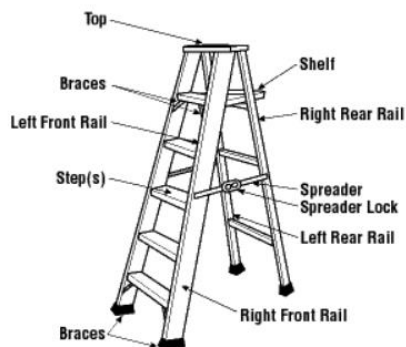
Ladders should only be used for work at heights when a risk assessment has shown that using equipment offering a higher level of fall protection is not justified because of the low risk and short duration of use; or there are existing workplace features which cannot be altered.

You should only use a ladder in situations where they can be used safely, such as on stable and level ground, and where it is reasonably practical to do so, or where the ladder can be secured.

TYPES OF LADDERS

STEPLADDERS

Many of the rules for straight ladders apply to stepladders as well. Never use a step ladder as a straight ladder. Use a platform type stepladder with side rails whenever possible. It provides greater support and a more stable working surface. Be sure to lock the stepladder – spread the legs to their limit and ensure the braces are locked.



Select a stepladder that is no more than 4ft. shorter than the height you want to reach.

Maximum Height You Need to Reach	Stepladder Height
7	3
8	4
9	5
10	6
12	8
14	10
15	11
16	12
18	14
20	16

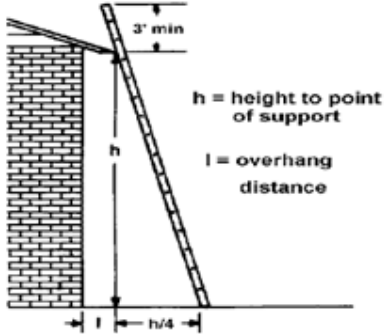
Before using a stepladder, read the precautions on the labels attached to the ladders, and check the load rating to ensure that you have the right ladder for the job.



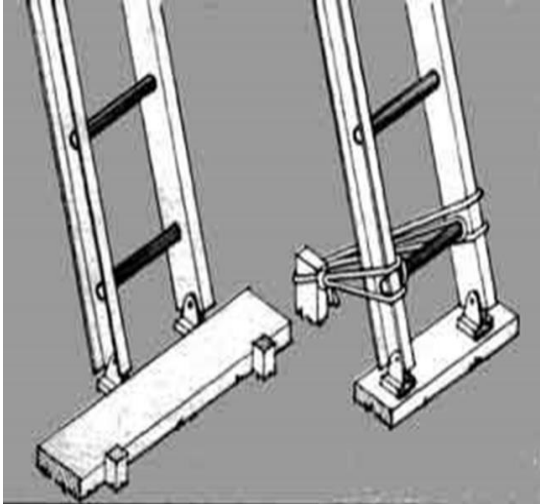
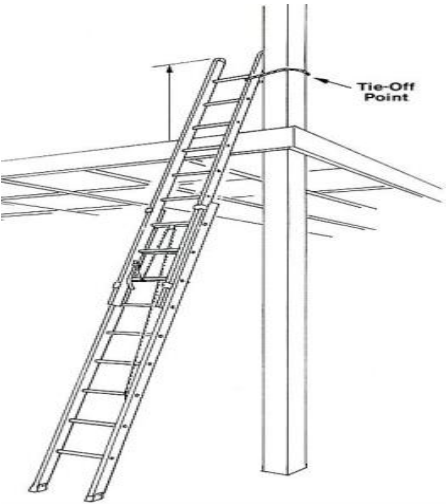
EXTENSION LADDERS

When using a straight or extension ladder, place the ladder on a firm surface. Make sure it has slip resistant feet, use secure blocking or have someone hold the ladder. When using extension ladders raise the extension ladder to the desired

height and ensure both sides are locked. The top of the ladder should extend at least 3 feet above the roof line/contact point. Follow the '4 to 1' rule: one foot back for each four feet up. When you set up the ladder, count the number of rungs up to the point where the ladder touches the wall. The bottom of the ladder must be one rung's length out from the wall for every four rungs up the wall.



Extension ladder should be secured at the top or bottom to prevent movement. The base of an extension ladder must be secured in place by using the safety feet on the ladder or by other means.



The top of the ladder should extend at least 3 ft. (.9m) above the landing to provide a hand hold for getting on and off of the ladder. If needed, secure the top of the ladder. Tie the top of the extension ladder to an anchor point.



Choose the right ladder for the height you need to reach.		
Ladder Height (ft.)	Maximum Reach (ft.)*	Height to Gutter or Top Support Point+
16	15	9 ft. max.
20	19	9-13 ft.
24	23	13-17 ft.
28	27	17-21 ft.
32	31	21-25 ft.
36	34	25-28 ft.
40	37	28-31 ft.

*Assume a 5 ft.-6 in. person with a vertical reach of 12 in.
+Support points for extension ladders reflect section overlap, ladder angle, or 3-ft. extension above roof line

FIXED LADDERS

Fixed ladders provide access by stair or ladder where regular access to equipment elevated either above or below exists. Appropriate safety devices and precautions must be used as per section 18 of the Industrial Establishment Regulations Reg. 851/90.

Always maintain a three-point contact. This is done by having two hands and one foot, or two feet and one hand on a ladder at all times. When climbing the ladder, face the ladder and place your feet firmly on each rung. Ensure your footwear is clean and free of mud, etc. If you need tools, raise or lower using a hand-line, or place the tools in a pouch.



APPLICABLE LEGISLATION

Under The Industrial Regulations and the Construction Regulations, ladders are regulated under the following sections:

O. Reg. 851/90:

Section 18- Fixed ladders

Section 19- Requirement for fixed Ladders

Section 73- Portable ladders:

A portable ladder shall,

- (a) be free from broken or loose members or other faults;
- (b) have non-slip feet;
- (c) be placed on a firm footing;
- (d) where it,
 - (i) exceeds six metres in length and is not securely fastened, or
 - (ii) is likely to be endangered by traffic,

be held in place by one or more workers while being used; and

(e) when not securely fastened, be inclined so that the horizontal distance from the top support to the foot of the ladder is not less than 1/4 and not more than 1/3 of the length of the ladder.

O. Reg. 231/91:

- Section 78-80- Design, construction and maintenance
- Section 81-82- Wooden ladders
- Section 83- Step ladders
- Section 84- Fixed Ladders

Where legislation may be applied under both regulations, the regulation with the more stringent requirements will be applied.

QUICK REFERENCE FOR LADDERS		
Height that work is conducted (m)	Type of protection needed	Legislation Reference (OH&S Act)
0 - 3 m	None needed. Although MOL can still issue the College orders	O.Reg.851, sec 45
3 – 6 m	Fall Protection needed	O.Reg.851, sec 85
6 m, or greater	Securely fastened, or held in place by another person	O.Reg.851, sec 73 (d) & (e)

LADDER HAZARDS

Ladder accidents usually are caused by improper selection, care or use, not by manufacturing defects.

Common hazards associated with ladders include:

- Falls from ladders
- Struck by falling ladders
- Struck by materials falling from ladders
- Tripping over ladders (erect or lying on floor)
- Lifting heavy ladders
- Striking persons or objects when carrying ladders
- Contact with electrical equipment

LADDER SELECTION

Portable ladders are designed as "one-man" equipment with the proper strength to support the worker as well as his tools and materials. Ladders are constructed under three general classes and sub-classes:

CSA or ANSI Standards Portable Ladder categories:				
Intended Use	Load Rating	Grade/Type	Weight Limit	Agency
Construction, utilities, and industrial	Special Duty	Type IAA	375 lbs.	ANSI
	Extra Heavy Duty	Type IA	300 lbs.	ANSI
	Heavy duty	Grade 1	113 Kg (250 lbs.)	CSA
		Type I	250 lbs.	ANSI
Light maintenance, office, and farm	Medium duty	Grade 2	102 Kg (225 lbs.)	CSA
		Type II	225 lbs.	ANSI
Household only	Light duty	Grade 3	91 Kg (200 lbs.)	CSA
		Type III	200 lbs.	ANSI

The ladder rating can be found on the side of the ladder, indicating the type and the weight rating. This sticker should be visible and marked with the CSA or ANSI logo as meeting the standard. Damaged or missing stickers should be noted in the ladder inspection.



The material that ladders are made of also must be considered when selecting the appropriate ladder for the tasks performed. Some ladders are not suitable for electrical work, while other are not suitable for temperature extremes. Some are more durable than others and are resistant while others are not, under certain conditions. Both class and type must be considered, based on the hazards that are present.

Aluminum	Fiberglass	Wood	Steel
Lightweight and strong	Strong and durable	Moderately durable material quality varies	Can be heavy but are designed for specific load requirements
Not safe to use with or near electricity	Safe for work with or near electricity	Not safe near electricity if it has metal reinforcing or is damp	Not safe for use with or near electrical
Resists most types corrosion (except caustics)	Resists corrosion	Can rot or be damaged by moisture or chemicals	Susceptible to rust and corrosion
Easily physically damaged	Resists physical damage	Resists physical damage	Resists physical damage
• readily conducts heat and cold	• resists heat and cold conduction	• resists heat and cold conduction	

Never use conductive ladders while doing electrical work. Aluminum or other conductive ladders, stepstools or climbing devices should never be used or stored in proximity to electrical panels, in electrical rooms or near any areas where unenclosed live electrical services could be present.



Once the grade and type of ladder have been selected, workers should use a ladder approximately a meter shorter than the height of the highest point to be reached.



LADDER INSPECTION

Ladders should be inspected at regular intervals, and prior to each use, using the ladder inspection checklist (see Appendix A). Ladders with defects or damage should be tagged and removed from service immediately. Ladder should be kept clean and free of debris in order to ensure that defects are visible.

LADDER INSPECTION	
<input type="radio"/> STEP	<input type="radio"/> EXTENSION
No. _____	
INSPECT UNIT CAREFULLY BEFORE SIGNING INSPECTION RECORD	
YES	NO
STEPS, RUNGS, UPRIGHTS & BRACES	
<input type="checkbox"/>	<input type="checkbox"/> LOOSE
<input type="checkbox"/>	<input type="checkbox"/> LOOSE FASTENERS OR OTHER METAL PARTS
<input type="checkbox"/>	<input type="checkbox"/> CRACKED, BROKEN, SPLIT OR WORN
<input type="checkbox"/>	<input type="checkbox"/> SLIVERED
<input type="checkbox"/>	<input type="checkbox"/> DAMAGED/WORN NON-SLIP BASES
HINGES	
<input type="checkbox"/>	<input type="checkbox"/> LOOSE HINGE
<input type="checkbox"/>	<input type="checkbox"/> LOOSE/BENT SPREADER
<input type="checkbox"/>	<input type="checkbox"/> SPREADER STOP BROKEN
LOCKS & ROPE	
<input type="checkbox"/>	<input type="checkbox"/> LOOSE, BROKEN OR MISSING LOCK
<input type="checkbox"/>	<input type="checkbox"/> IMPROPERLY SEATED WHEN EXTENDED
<input type="checkbox"/>	<input type="checkbox"/> WORN OR ROTTED ROPE
GENERAL	
<input type="checkbox"/>	<input type="checkbox"/> WOBBLY
SEE OTHER SIDE	

All components of the ladder should be inspected, including: rungs, rails and locks, labels, pail shelf, top, spreaders, feet, ropes, hardware, bracing, and the overall condition of the ladder. When inspecting the ladder, the user should look for some of the following defects:

- Missing or loose steps, damaged rungs or worn non-slip feet
- Loose nails, screws, bolts or nuts

- Loose or faulty spreaders, locks and other metal parts in poor condition
- Rot, decay or warped rails (on wooden ladders)
- Cracks and exposed fiberglass (on fiberglass ladders)
- Cracked, split, worn or broken rails, braces, steps or rungs
- Rough edges on nails or rungs
- Rough or splintered surfaces
- Corrosion, rust, oxidization and excessive wear- especially on treads
- Twisted or distorted rails
- Missing identification labels
- Wobble
- Loose or bent hinges and hinge spreaders
- Broken stop on hinge spreader
- Broken or missing locks
- Insufficient ease of movement of moving parts
- Sag

LADDER STORAGE

Ladders can be stored vertically if secured to a wall or structure, or horizontally in a rack that supports the ladder at least every 2 ft., to prevent sagging. The ladder should be protected from weather, sunlight and excessive temperatures. It should be stored in such a way as to make it easily accessible for workers. Ladders should not be hung from rails or rungs, nor should other items be stored on the ladder.

LADDER MAINTENANCE

Wood ladders should be protected with a clear sealer varnish, shellac, linseed oil or wood preservative. Wood ladders should not be painted, because the paint could hide defects. Check carefully for cracks, rot, splinters, broken rungs, loose joints and bolts and hardware in poor condition.

Aluminum or steel ladders should be inspected for rough burrs and sharp edges before use. Inspect closely for loose joints and bolts, faulty welds and cracks. Make sure the hooks and locks on extension ladders are in good condition. Replace worn or frayed ropes on extension ladders at once.

Fiberglass ladders should have a surface coat of lacquer maintained. If it is scratched beyond normal wear, it should be lightly sanded before applying a coat of lacquer.

TRANSPORTING A LADDER

When carrying a ladder, position it on its side and hold it near the center. Longer or heavier ladders should be carried by 2 people. When assisted by another worker, walk on the same side of the ladder and stay in step. Verbally let the other worker know if you plan to stop suddenly, change direction or must put the ladder down. Be careful when walking through high traffic areas such as hallways, doorways or going around blind corners.

ERGONOMIC FACTORS WHILE USING A LADDER

In order to prevent ergonomic injuries while using a ladder, it is important to ensure that you keep your body centered on the ladder and do not overreach. Best practice dictates that a person's belt buckle should never go beyond a ladder's sides while they are on a ladder. This practice will prevent injuries to the back, neck, shoulders and arms as well as provide greater stability on the ladder.

When descending the ladder, face the ladder until both feet have touched the floor, and do not twist when stepping off.



GENERAL LADDER SAFETY

Never stand on the top of step just below the top step as these are not designed to support a load. They are meant to be gripped or to support light weight equipment or tools. Leg contact with the top step assists the worker maintaining balance.



Other safety tips:

- Only use a step ladder when full opened, locked and set up level, on firm ground. A stepladder is not safe to use when folded or in a leaning position.
- Never climb the back of the stepladder.
- Never leave a ladder set up and unattended in public areas or where it could obstruct other activities.
- Do not join two short ladders to make a longer ladder. The side rails are not strong enough to support the extra load.
- Do not allow anyone to stand under the ladder while.
- Do not use a ladder placed in a horizontal position as a scaffold, plank or runway.
- Do not use a chair, barrel, box or other object as a makeshift ladder.
- Wear the appropriate footwear when using a ladder such as slip resistant, low

- heel shoes.
- If you access to a fixed ladder stairway or scaffold, use it instead of a portable ladder.

SAFETY PROCEDURES

When working on cylindrical objects like poles and columns, the top rung of portable ladders can be replaced with chain or rope to reduce rocking. Aluminum ladders are very corrosion-resistant, but exposing them to fertilizer can cause damage.

Use the ladder inspection checklist (page 9) to remind yourself of what you should look out for in order to prevent accidents

When any ladder must be set up next to an unprotected edge where a fall of 3 meters (10 feet) or more could occur, workers using the ladder must be protected by a fall-arrest system.

Users must always keep three point contact at all times.

Ladders not tied off, or otherwise secured before being used.

Do not hand -carry loads on a ladder.

Do not try reaching so far that you lose your balance; move the ladder.

Non-skid feet or spurs may prevent a ladder from slipping on a hard, smooth surface.

Do not stand on the ladder's top three rungs

A damaged side rail may cause one side of a ladder to give way

POWER ELEVATED MOBILE WORK PLATFORMS

It is the responsibility of all users to read and comply with the following common sense rules which are designed to promote safety in the operation of power elevated mobile work platforms. These rules do not purport to be all-inclusive nor to supplant or replace other additional safety and precautionary measures to cover usual or unusual conditions if these rules conflict in any way with any provincial statute or regulation said statute or regulation shall supersede these rules and it shall be the responsibility of the user to comply therewith.



THE EQUIPMENT

- The lift must be certified in writing by an engineer that the elevated work

platform complies with the National Standard of Canada (NSC).

- The platform must be equipped with guardrails.
- Signs on the work platform must have signs that are clearly visible to an operator, at its controls, indicating the rated working load, all the limiting working conditions and warnings by the manufacturer (and direction of machine movement for non-boom type elevating work platforms.
- The platform must be equipped with a guardrail.
- The name and number of the NSC, and the name and address of the owner of the equipment, must be clearly visible to the operator.
- The operating manual must be kept with the equipment at all times.

WORK AREA SURVEY

Before operating the machine, the operator must make a work survey of hazards such as loose soil, ditches, debris, overhead electric lines, unguarded openings, chemicals, adequate lighting, obstructions or hazardous conditions created by other trades.

The machine should not be operated on surfaces other than those intended by and set out in the manufacturer's instructions.

A safe distance must be maintained from overhead power energized lines as directed by the voltage and relevant legislation.

INSPECTION AND MAINTENANCE

The equipment must be inspected daily by a trained worker. Such inspections should include the daily maintenance checks in accordance with manufacturer's instructions and a visual inspection of the machine for damage. Any devices, which do not appear to operate properly, or equipment that has obvious defects must be repaired before being operated.

A maintenance tag must be attached to the equipment near the operator's station, which includes the date of the last maintenance and inspection, the name and signature of the person who performed the work, and the work carried out.

The owner of the equipment must retain a permanent record of all inspections, tests, repairs, modifications, and maintenance performed on the elevating work platform. Records must include the name and signature of the persons who performed the maintenance, test or repairs.

TRAINING

Workers must be properly instructed on applicable model before they operate the equipment. Such instruction should include a review of manufacturer's operating instructions. Location of all emergency devices, safety decals, daily maintenance checks, machine limitations and pertinent regulations regarding use of the equipment.

Workers must be able to exercise common sense and be competent to operate this equipment.

The operator must have oral and written instructions on the use and limitations of the elevated work platform.

Workers need to be made aware of all written emergency procedures in the event of an accident.

Workers must be provided with training regarding all necessary PPE, including a Ministry of Labour approved Working at Heights certification. This applies to any contractors working on Campus.

PROCEDURES FOR SAFE OPERATION

- Never use equipment for purposes or in ways other than which it was intended
- Do not work on platforms if your physical condition is such that you feel dizzy or unsteady in any way. Workers must ascend to and descend from the platform using the facilities provided.
- A worker must not operate a powered elevating movable work platform when illness medication, drugs or alcoholic beverages impair his physical abilities.
- A worker must wear a safety belt attached to the platform when it is being moved.
- The elevated work platform must not be loaded in excess of its rated working load or in such a way that affects its stability or endangers a worker. All accessories must be installed and used in accordance with manufacturers recommended procedures
- The elevated working platform must be parked on a firm and level surface while in use.
- The area around the elevated work platform should be secured through barriers or fencing to prevent unauthorized access to the work area and prevent injury to pedestrians in proximity to the work.
- The proper PPE must be provided and maintained in good working condition, and in accordance with all applicable standards and legislated requirements.
- Proper supervision is required.

- The operation of any work platform is subject to certain hazards that cannot be protected against by mechanical means but only by the exercise of intelligence, care, and common sense. Therefore, it is essential to have competent careful operators that are physically and mentally fit and thoroughly trained in the safe operation of this type of equipment. *If you do not fit this description do not operate equipment.*

GUARDRAILS

- Do not use machine without guardrails. Do not stand on guardrails to gain extra reach Do not use guardrails to carry materials unless designed for this purpose and do not allow excessive overhang of materials when elevating the platform.
- Do not lean out over platform railings to perform work.
- Do not use ladders or makeshift devices on the platform to obtain greater height.
- All personnel must remain clear while equipment is in use. Do not climb up or down extendible, articulating or scissor arms.
- Outriggers or stabilizers must be used in accordance with manufacturer's recommendation.
- Care must taken to prevent ropes, electric cords, hoses, etc. from becoming entangled in equipment when platform is being elevated or equipment moved.
- Do not alter equipment or override safety devices in any way.
- It is the responsibility of the operator to ensure that the load of workers, materials and tools on the platform does not exceed the capacity of the machine. Loads should be secured from rolling or excessive movement.
- The machine must not be moved until the operator has determined by visual inspection that the direction of intended movement is clear of hazards, obstructions, and other site personnel.
- Maintain a 3-point contact when getting on or off of the platform.
- Under no circumstances may a machine be modified without the written approval of the manufacturer. In addition, the machine must not be operated when any of the safety devices are inoperable.
- When a scissor or boom lift is left unattended by the operator, the unit shall be locked or rendered inoperative, to prevent the device from being started or set in motion by an unauthorized person.
- Ensure controls and safety devices are operating properly and control decals are legible.
- The operator of an elevating work platform must be aware of their position in tight areas. Subject to the findings of the risk assessment, an operator should operate the machine with extra care when working near obstructions.
- Operators working alone in restricted areas may be at risk, as others may not be aware of any distress if the worker becomes trapped or crushed. Constant monitoring and/or communication should be considered, as delay for assistance to the worker may prove fatal.
- All workplace parties are to assess risks of trapping or crushing hazards.
- Employers and supervisors must take the lead in identifying when trapping or crushing risks are present in the work activities they control. Where trapping or crushing risks are present, extra care is needed and all involved must understand what action is required to avoid or reduce the risks involved.

IF YOU DO NOT UNDERSTAND THESE INSTRUCTIONS ASK YOUR SUPERVISOR FOR CLARIFICATION.

GUARDRAILS

Guardrails are the first line of defense in fall prevention. They should be installed along the open sides of any area where a worker may fall 2.4 metres (8 feet) or more or into water, operating machinery, or hazardous substances. Areas to be protected include:

- floors and floor openings
- balconies
- slab formwork
- stairways and landings
- roof tops
- scaffolds and other work platforms
- runways and ramps
- bridge surfaces.

Guardrails should have a top rail, mid-rail, and toeboard secured to vertical posts or supports.

Available in wood, wood-slat, wire rope, and manufactured wire mesh systems, guardrails must meet the following minimum dimensions:

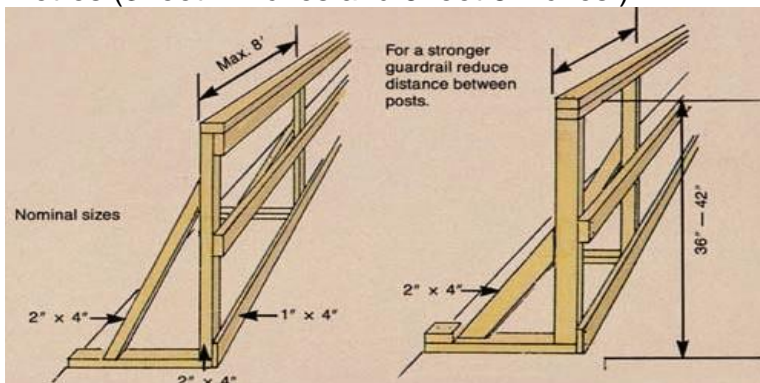
- top rail between 91 cm (3 feet) and 1.07 metres (3 feet, 6 inches) high
- toeboard at least 10.2 cm (4 inches) high and installed flush with the surface posts no more than 2.4 metres (8 feet) apart.

These components should be secured to the inside of the posts or jacks.

Toeboards should be installed on all open sides of a scaffold or work platform.

Guardrails should be installed as close to the edge as possible and must be capable of resisting any load likely to be applied. This may require extra reinforcement in special situations, such as where forklifts or buggies are used.

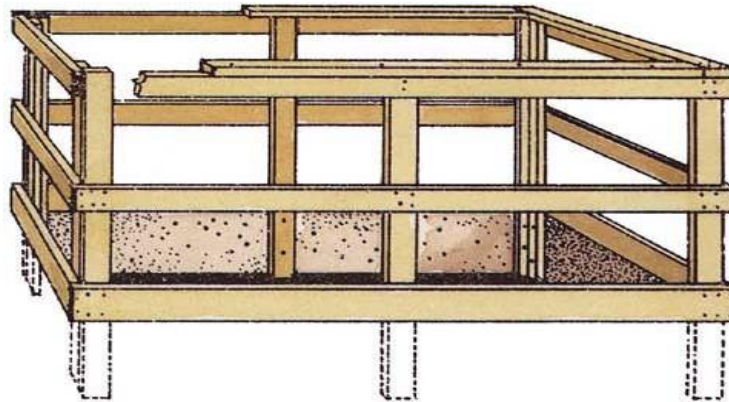
For maximum resistance to sideways force, the 2x4 top rail of wooden guardrails should be laid flat, with the larger dimension horizontal. To further strengthen guardrails, double the top rail and reduce the spacing of posts to between 1 and 2 metres (3 feet 4 inches and 6 feet 8 inches.)



Wood guardrails must be supported by posts extending to the top rail and braced and solidly fastened to the floor. Shoring jacks used, as posts should be fitted with plywood softener plates at top and bottom. Snug up and check the posts regularly for tightness.

For slabs and the end of flying slab forms, manufactured posts can be attached to the concrete with either clamps or insert anchors.

If guardrails must be removed, the opening edge should be roped off and marked with warning signs. In addition, workers should use a fall-arrest system properly anchored and tied off.



Fall protection: two basic types

In construction, eliminating the risk of falls may not be possible. It then becomes essential to select proper fall protection.

Two basic types of fall protection are:

- fall arrest
- fall restraint

Where guardrails or other protection is not in place, you must use a fall-arrest or travel-restraint system if you are in danger of falling:

- more than 3 metres
- into operating machinery
- into water or another liquid
- into or onto a hazardous substance or object.

QUICK REFERENCE FOR SCAFFOLDS AND LIFTS		
Height that work is conducted (m)	Type of protection needed	Legislation Reference (OH&S Act)

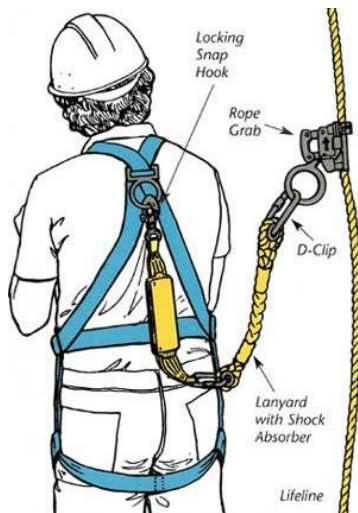
0 - 3 m	None needed. Although MOL can still issue the College orders	O.Reg.851, sec 45
3 m, or greater	Fall Protection needed	O.Reg.851, sec 85

FALL ARREST

Fall arrest is the most common system. It stops a fall within a few feet of the worker's original position. A full body harness is required with a fall-arrest system. A typical system consists of the following parts connected together:

- full body harness (CSA- certified)
- lanyard (with locking snap hooks or D-clips)
- rope grab lifeline
- lifeline anchor

A fall-arrest system must be worn when you are on a rolling scaffold that is being moved or when you are getting on, working from, or getting off suspended access equipment such as a swingstage or bosun's chair.



Employees exposed to a free fall distance of 3 m (10ft) or more (without restraint) must wear fall arresting equipment, using a full-body harness system. Inspect components of the fall arrest system before each use for wear, damage and other deterioration. Defective components are removed from service when the components' function or strength has been adversely affected.

Fall arrest equipment must meet the minimum criteria:

- hardware used must be drop-forged, pressed or formed steel, with a corrosion-resistant finish, with surfaces and edges smooth to prevent

- damage to the attached body harness or lanyard;
- vertical life-lines must have a breaking strength specified by the manufacture as 27 kN (6000lbs); termination knots or splices cannot reduce the strength of lifeline to less than 22 kN (5000lbs)
- horizontal life -lines must be 12 mm diameter wire rope with a manufactures specified breaking strength of at least 89 kN (20000 pounds);
- increase the above forces by 25% if two workers are connected to the same horizontal static line. Lanyards must have a minimum tensile strength of 2449 kg (5400lb).
- body harness components must be CSA-approved.

Secure full-body harness systems to anchorage points capable of supporting 2272 k (5000lb).

Protect safety lines and lanyards against cuts or abrasion. Limit the free fall distance (through rigging) to a maximum of 1.2 m (4 ft.) without a shock absorber or 6 1/2 ft. with a shock absorber. Only one employee may be attached to any one vertical lifeline. Connect only one snap hook to any one D-ring. Snap hooks must not be connected to one another.

FALL RESTRAINT

Travel-restraint systems prevent falls by restraining a worker from getting too close to an unprotected edge.

A travel restraint system must be arranged to keep the worker back from the fall hazard area. The system usually consists of

- safety belt of full body harness (CSA-certified)
- lanyard
- rope grab
- lifeline
- lifeline anchor.

The basic problem with fall-restraint systems is that the rope grab must be continually adjusted to allow free movement and travel but still keep the worker away from the edge. One technique is to use a self-retracting lifeline (see article below).

Restraint protection is rigged to allow the movement of employees only as far as the sides and edge of the walking/working surface. Temporary anchorage points used for fall restraint must be engineered to be capable of supporting four times the intended load, with a minimum strength requirement of 364 kg (800 lb).

Work within the confines of a perimeter (standard) guardrail.

Wear an approved safety belt or harness attached to securely rigged restraint lines where:

- safety belt and/or harness conform to all CSA (Canadian Standards Association) Standards
- rope-grab devices must be used in accordance with manufacturer's recommendations and instructions.
- Inspect fall restraint components before each use, for wear, damage and other deterioration. Remove defective components from service when the component's function or strength has been adversely affected.
- fall restraint components must be compatible
- Tie restraint lines, independently of other lines, to the anchorage point.

In practice, fall-restraint systems are not foolproof because the length of the lifeline is not always adjusted properly. If the self-retracting lifeline, for instance, is longer than the distance to the nearest edge, a worker moving in that direction will not be restrained before falling.

But even if the system doesn't *prevent* a fall, it still *arrests* the fall.

SELF-RETRACTING LIFELINES

Self-retracting lifelines (SRLs) are widely used in construction to provide fall protection, especially where workers must move about to handle or install material. SRLs let the user move the full length of the line but stop and lock at any sudden pull. This action is designed for fall arrest -- not for travel restraint.

Users of SRLs most know the manufacturers' recommendations for proper operation as well as any safeguards required for specific applications.

SRLs have traditionally been anchored above the worker's head with the line running near vertical down to the worker's safety belt or harness. There's general agreement that this is the best application of SRLs.

In construction, however, different applications have appeared. In addition to the traditional position, two other basic options are

Not all of the manuals, however, cover the use of SRLs in horizontal applications. In these cases the user must confirm that the particular model is approved for horizontal use. The manufacturer will then outline requirements for proper horizontal use.

Remember -- SRLs are NOT travel restraints. Travel restraints are designed to restrain the user's movement near open edges and prevent falling altogether.

The only time an SRL can act as a travel restraint is when the line is completely drawn out yet still short enough to keep the user from moving forward or laterally

into a hazardous location.

INSPECTIONS

Fall-arrest systems can only prevent fatal falls if they are used properly. Correct use includes inspection. Your life depends on it.

The anchor and unit at the ridge of a pitched roof above the worker's location
The anchor and unit situated on a flat work surface so that the lifeline is drawn out by the worker in a horizontal plane.

Each manufacturer's manual provides information and guidelines for SRLs anchored above a worker's head.

Harness

Always check the tag for date of manufacture. Most web-type harnesses have a service life of five years. If the harness doesn't have a tag, don't use it.



Look for cuts, fraying, broken stitching, and other damage to webbing. Check for chemical or heat damage.

Inspect metal buckles for distortion, cracks, and sharp or rough edges. All buckles should slide easily for adjustment.

Check for worn, cut, or frayed fibres where buckles attach to harness. Inspect D-ring for distortion, cracks, sharp or rough edges, and chemical or heat damage.

Ensure that the plate holding the D-ring in position is free from cracks, heat damage, and other defects. The plate must keep the D-ring from sliding out of place.

Lanyard

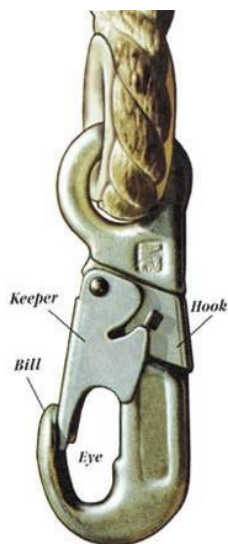
Most lanyards have a service life of five years. Check tag for date of manufacture. Inspect lanyard for worn, broken, or cut fibres; signs of stretching; evidence of chemical or heat damage; and cracked or distorted connecting hardware.

Shock Absorber

A shock absorber should carry a tag indicating date of last inspection. If the tag is missing, return the absorber to your supervisor for advice on its suitability. If the absorber is made with tear-away stitching designed to absorb fall-arrest load, make sure stitching is intact.

Snaphook

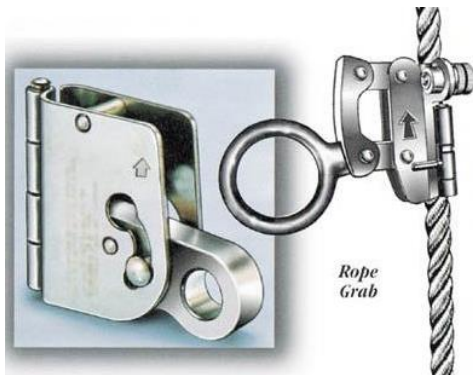
- Check for cracks and corroded or pitted surfaces.
- Ensure that bill and eye sections are not twisted or bent.
- Check that locking mechanism works properly. Push the keeper into the open position with the
- mechanism still engaged. If the keeper opens, discard the snaphook immediately.
- Ensure that spring has enough tension to close keeper securely.
- Open the keeper and release.
- The keeper should sit into the bill without binding.



Rope Grab

- Make sure that grabs are installed right side up. Most grabs feature a directional arrow to indicate proper orientation.
- Ensure that proper size lifeline is used. The required size is marked on the rope grab.

-Mount the grab on the lifeline. Pull the grab down sharply. The grab should lock within 30 cm (12 inches).



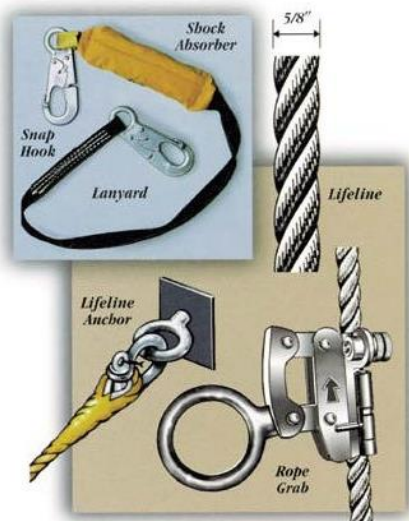
Lifeline

Lifelines must be at least 16mm diameter polypropylene or material of equal strength. Inspect lines from end to end before installation. Look for cuts, burns, fraying, and chemical or heat damage. Signs of decreased diameter may indicate that line has been involved in a fall arrest and should be discarded.

Lifeline Anchorage

- Ensure that lifelines are securely attached to solid anchor points.
- Whenever possible, attach only one lifeline to each anchor.
- Never anchor to bundles of material that may be moved or depleted through use.

Do not anchor to exposed rebar unless embedment length is adequate.



CONTROL ZONES

The use of a Control Zone is prohibited on a surface where the slope exceeds 4 vertical and 12 horizontal or for scaffold erection and removal.

A Control Zone is used for leading edge or fixed edge work where:

- a minimum distance from the edge of 2 m (6.5 ft) is used to protect employees and students, not wearing fall arrest or fall restraint equipment; NOTE: the Control Zone should be expanded during adverse condition, (e.g. slippery roof) or when working at an additional elevation within the "Safe Zone" (e.g. on a step ladder)
- employees or students working within the "control zone" must be using appropriate fall arrest or fall restraint equipment
- if work is to be conducted inside the Control Zone warning lines must be installed to identify the Control Zone. The lines must be highly visible and maintained at a height of between
- 0.85 m and 1.15 m (34" and 45") at intervals not exceeding 1.8 m (6ft).

FALL PROTECTION PLANNING

- Identify all fall hazards anticipated during the course of the project.
- Describe the method of access to the work area.
- Describe the methods of material and tool handling used on elevated surfaces.
- Establish procedures for inspecting fall protection equipment.
- Identify the tasks and applications requiring worker fall protection.
- Match tasks and applications to appropriate fall protection systems.
- Describe assembly, maintenance, inspection and disassembly procedures for the fall protection systems used.
- Describe procedures for handling, storing, and securing fall protection equipment.
- Describe methods of securing lanyards and lines.
- Identify anchor locations.
- Identify areas where workers may be exposed to falling objects and define measures for protecting them.
- List workers who have been trained to use safety equipment on the job site.
- Describe how workers injured by falls will be rescued and if need be, medically treated.
- Post emergency phone numbers and make all workers aware of them.
- Describe equipment available for rescue and retrieval.
- Post essential elements of the fall protection plan, if utilized, at the work site and, make all workers aware of them.

EMERGENCY RESPONSE IN THE EVENT OF A FALL

When a worker falls and is suspended in a harness, it is important to rescue him or her as quickly as possible because:

- The worker may have suffered injuries during the fall and may need medical attention.
- When workers are suspended in their safety harnesses for long periods, they may suffer from blood pooling in the lower body. This can lead to suspension trauma.
- Suspended workers may panic if they are not rescued quickly.
- The event that led to the fall may create additional risks that need to be addressed.

Before beginning work, a rescue plan should be developed and all workers involved should be trained on the procedure/ emergency plan.

RISKS ASSOCIATED WITH BEING SUSPENDED

When a worker falls while in a harness and is hanging immobilized but still conscious, they are at great risk as each minute passes. The danger for their safe recovery begins within 3 minutes of being suspended, so time is of the essence. The harness restricts blood flow at the thighs/ groin area and under the arms, reducing the amount of blood flowing to the brain and to the heart. This blood flow restriction puts workers at risk of trauma, illness and death. It is important to remember that workers who are suspended in a fall arrest harness may not appear to have suffered any trauma. Workers have, however; suffered from *suspension trauma* (also known as harness hanging syndrome) or orthostatic intolerance, which occurs when the body is held upright without any movement for a period of time. With the addition of the constriction of the harness, over a period of a few minutes, workers will faint, due to lack of blood flow. But the risk does not end there. If, upon rescue, the blood is allowed to rush back into their bodies, it could cause a condition called *rescue syndrome* and will almost certainly cause death. Proper rescue plans, training and engaging in the proper rescue procedures will allow the blood to return to the body at a more regulated pass and prevent this from occurring.

WHAT CAUSES REFLOW SYNDROME?

- The blood that we now understand has been pooling in the legs becomes 'stale' after 10-20 minutes
 - This means it has been drained of oxygen and is saturated with CO₂
 - The blood is also now loaded with toxic wastes from the body's fat burning process

- Re-elevating the legs will return this blood to the rest of the body in a massive flood.
 - This can stop the heart
 - This can result in damage to the internal organs, particularly the kidneys
- You have to slow the return of this stale blood, but still keep enough blood flowing to the brain to keep the person alive. (Good thing you have a rescue plan - and have practiced it!)

When a worker is suspended:

- They will have general feelings of unease (they did just have a fall after all)
 - This can include being dizzy, sweaty and other signs of shock
 - They will have an increased pulse and breathing rates
- They will then experience a sudden drop in their pulse and blood pressure
- This will result in an instant loss of consciousness
- If they are not rescued quickly, death is certain
 - Resulting from suffocation due to a closed airway, or from a lack of blood flow and oxygen to the brain



PERFORMING THE RESCUE

- Whatever plan you have written, it is vital that the lowering system can be controlled to prevent the worker's body from being laid flat as it reaches the ground.
- Anyone released from immobile suspension should be kept in a sitting position for **at least 30 minutes**
- Keep the harness on and do not release the leg straps
- Try to get the person to sit in the 'W' position (legs pulled towards chest) if possible
- KED boards should be used if spinal precautions are needed – and if trained to use!
- Let EMS know it is a fallen worker and that the worker should not be laid flat. They should be transported in the sitting position to the nearest hospital unless in cardiac arrest

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