

FALL PREVENTION STANDARD

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LIST OF VERSIONS

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DEFINITIONS APPLICABLE TO THIS DOCUMENT

OSHA	Occupational Safety and Health Administration is a division of the labor office in America with the mission to ensure that employees work in a safe and healthful environment by setting and enforcing standards, and by providing training, outreach, education, and assistance.
ANSI	American National Standards Institute - an independent institute that develops engineering standards. ANSI developed the 'Fall protection Code Z359' code in which all applicable standards & technical specifications are included for the use, designs, maintenance & inspection of PFAS.
PFAS	The Personal Fall Arrest System is used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.
Anchorage	A secure point for attaching a lanyard, lifeline or other component of a travel restraint system or fall-arrest system. Anchorages require specific load and impact capacities for their intended use according to OSHA & ANSI fall prevention standards.
Double or triple action device	A self-closing hook or karabiner with a keeper latch which will automatically close and remain closed until manually opened. These units have a minimum of at least two distinct and deliberate consecutive actions to manually open them.
Free fall	Any fall or part of a fall where the person falling is under the unrestrained influence of gravity over any fall distance, either vertically or on a slope on which it is not possible to walk without the assistance of a handrail or hand line.
Same level fall	Fall resulting in injury produced by impact during slip, trip & fall without elevation
Fall	A fall by a person from one level to another.

Maximum Arresting Force (MAF)	The peak dynamic force exerted on the body during a fall. This should never exceed 1800 lbs/8kN
Inertia reel	A self-retracting lanyard or fall-arrest block. Is a type 2 or 3 fall-arrest device that arrests a fall by locking onto a line and at the same time allows freedom of movement.
Karabiners	These are metal types of connectors that can be attached to anchorage points. They come in a variety of sizes, shapes and locking mechanisms to suit various applications. They should be self-closing and self- or manual-locking and capable of being opened only by at least two consecutive deliberate manual actions.
Lanyard	An assembly consisting of a line and components which will enable connection between a harness and an anchorage point and will absorb energy in the event of a fall or restrict worker movement.
Personal energy absorber (or deceleration device)	A device which reduces the deceleration force imposed when a fall is suddenly arrested, and correspondingly reduces the loadings on the anchorage and the person's body. The energy absorber may either be a separate item or manufactured as part of the lanyard.
Restraint line	The line securing workers to a point of anchorage and is used to prevent a person from reaching a point from which he or she could fall.
Static line	A horizontal or substantially horizontal line to which a lanyard may be attached, and which is designed to arrest a free fall.
Deceleration Distance	The total distance the fall arrest system elongates and comes to a full stop.
Total fall distance	The total distance a person is likely to fall during both the free and restrained parts of a fall and includes the maximum dynamic extension of all supporting components.
Clearance	Distance between the workers foot and the nearest obstruction following a fall event.
Risk of a fall	A circumstance that exposes a worker while at work, or other person while at or in the vicinity of a workplace, to a risk of a fall that is reasonably likely to cause injury to the worker or other person.
Risk control	Taking action to eliminate health and safety risks so far as is reasonably practicable, and if that is not possible, minimising the risks so far as is reasonably practicable. Eliminating a hazard will also eliminate any risks associated with that hazard.
Rescue and retrieval	The rescue system that will be used to retrieve a fallen person when suspended in a harness.
Suspension trauma	Suspension trauma is a form of ill health that results when an individual is suspended in a relatively immobile position for an extended period

	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

Scaffold	A scaffold is a temporary raised platform on which workers stand to paint, repair, or build high parts of a building.
Ladder	Equipment used for climbing up and down, that consists of two vertical bars or pieces of rope joined to each other by a set of horizontal steps.
Hierarchy of control	The hierarchy of control measures is a risk control system that provides a clear pathway to how working at heights risks should be dealt with in accordance with OSHA guidelines on managing risks. The system ranks control measures from the highest to lowest levels of protection for the worker.
Authorized person	A person approved or assigned by his employer to perform a specific type of duty or duties or to be at a specific location or locations at the jobsite.
Competent person	A person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.
Qualified person	One who by possession of a recognized degree or professional standing or who by extensive knowledge, training and experience has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

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Contents

1. INTRODUCTION	7
2. PURPOSE	7
3. SCOPE	7
4. RESPONSIBILITIES	8
4. MINIMUM REQUIREMENTS	9
5. INSTRUCTIVE NOTES	11
5.1 IDENTIFYING FALL HAZARDS.....	11
5.1.1 Assessing the risk of a fall.....	11
5.1.2 Managing the risk of a fall.....	11
5.1.3 Fall Risk Control implementation.....	14
5.2 USE OF FALL PREVENTION DEVICES.....	14
5.2.1 Work platforms.....	14
5.2.2 Work positioning systems.....	14
5.2.3 Restraint technique.....	15
5.2.4 fall arrest systems.....	15
5.2.5 Industrial rope access systems.....	16
5.2.6 Industrial safety nets.....	16
5.3 FALL PREVENTION SYSTEM COMPONENTS.....	17
5.3.1 Anchorage points.....	18
5.3.2 Free fall distance.....	18
5.3.4 Full body harnesses.....	19
5.3.5 Maintain minimum of slack in fall-arrest lanyard.....	19
5.3.6 Use inertia reels correctly.....	19
5.3.7 Use compatible components.....	19
5.3.8 Ensure prompt rescue in event of fall.....	19
5.3.9 Hazards with individual fall-arrest systems.....	20
5.3.10 Vertical and horizontal lifelines.....	20
5.3.11 Double lanyards & self retracting lanyard.....	21
6. LADDERS SAFETY	23
6.1 EXTENSION OR SINGLE LADDERS.....	23
6.2 STEP LADDERS.....	24
6.3 FIXED LADDERS.....	25
6.4 LADDER MAINTENANCE.....	26
7. FIXED SCAFFOLDS	26
7.1 SAFETY CONSIDERATIONS SCAFFOLDING.....	26
7.2 INFORMATION, INSTRUCTION AND TRAINING FOR WORKERS USING SCAFFOLDS.....	27
7.3 MOBILE SCAFFOLDS.....	27
8 ELEVATING WORK PLATFORMS	27
9. EMERGENCY PROCEDURES FOR FALL	28
9.1 SUSPENSION INTOLERANCE.....	29

	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

9.2 TRAINING FOR RESCUERS 29

10. DOCUMENT CONTROL..... 30

11. REFERENCES..... 30

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	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

1. INTRODUCTION

Rosebel Gold Mines (RGM) recognizes that falls from height can result in serious injury, including fatalities. Statistical falls from height contribute to many workplace fatalities worldwide. Serious injury and or fatalities can also result from falls at ground level into trenches, pits, etc. The risk of a fall from one level to another (working at heights risk) is common in the work RGM does and it needs to be proactively identified and controlled. The most common reasons for working at heights related incidents are:

- Less than adequate planning
- No or inadequate training
- Misuse and incorrect use of PFAS
- Unguarded edges, pits, excavations, etc.
- Failing to identify the working at heights (WAH) risks.
- Improper use and or selection of fall protection harness.
- Incorrect setup and use of elevated work platforms (EWP).
- No certified or improper anchor points
- Poor communication
- Poor design of fall prevention system
- Inadequate or no rescue plan

2. PURPOSE

The purpose of the Fall Prevention standard is to control and manage the risk of falls at RGM so serious injuries or fatalities are prevented.

3. SCOPE

This standard provides guidance about the minimum requirements that need to be met to control the risk of falling from heights at RGM. This document serves as a reference for Working at Height and Fall Protection training. This document applies to all RGM controlled activities including work performed by contractors.

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4. RESPONSIBILITIES

Health & Safety superintendent is responsible for:

- Appointing and training of Fall Competent and Qualified persons.
- Ensuring that authorized, competent, and qualified personnel are trained in the proper application, use, and inspection of the fall arrest equipment and fall prevention systems.
- Ensuring that the necessary follow-up and oversight for the correct application and use is applied to the respective situation.
- Conducting area fall surveys and implement action plans to eliminate/reduce these risks.
- Conducting job specific fall hazard assessments and implementing necessary measurements to manage fall risks to acceptable levels.
- Ensures quarterly inspections are conducted on PFAS, ladders and fixed anchor points.
- Providing advise on purchase and correct use of PFAS.
- Validate all training records from contractors and approve for commencement of any working at height activities.
- Provide the necessary specialized rescue support if required.

Area superintendents are responsible for:

- Using hierarchy of control during planning of working at height tasks (*see figure 1: Hierarchy of control*)
- Evaluating the need for personal fall arrest equipment and fall prevention systems as an integral part of pre-planning the job.
- Supplying and maintaining the proper fall equipment for the job.
- Auditing of contractors for compliance with this standard.
- Ensure that all employees exposed to working at heights have completed the required training.
- Ensures that all permits/fall prevention plans are issued and present at the workplace.
- Have fall rescue plan in place during working at heights.
- Have proper housekeeping in place to prevent same level fall.
- Consideration of hazards during the task as well as traveling to and from the elevated work area.
- Considering the use of temporary scaffolding, handrails, aerial lifts, etc.

Employees & contractors are responsible for:

- Participate in required Authorized & Competent person training for working at heights.
- Using a questioning attitude and anticipating the unexpected during the JHA and fall rescue plan debrief.
- Discussing any potential hazards that may develop during the job with the supervisor, project coordinator or engineer, foreman or leader, before continuing.
- Full compliance with all safe work practices outlined by site specific conditions, work rules, JHA, training or other requirements of Fall Prevention standard that are within the employee's control.
- Properly using, maintaining and pre-use inspection of fall arrest equipment or systems.

- Report and correct any deficiencies in fall prevention systems before use.
- Following all guidelines in the Fall Prevention standard at a minimum.
- Providing all training paperwork and documentation required by the standard to the H&S superintendent for validation and only upon receiving approval the task may be carried out.
- Contractors that require working at heights shall have all exposed employees trained as Fall Authorized person (8-hour class room) and have trained fall competent person (16 hour class room) supervise the task
- Using the hierarchy of control when performing work independently.
- Ensure permits/fall prevention plan are issued by supervisors and required documentations are reviewed before starting with any work.
- Stopping any work immediately when working at heights is conducted not in compliance with this standard.
- Having proper housekeeping in place to prevent same level fall.

4. MINIMUM REQUIREMENTS

The minimum requirements are based on OSHA & ANSI requirements for Fall prevention. OSHA & ANSI mandates that fall prevention measures should be in place whenever a fall could occur from a height of 1.8 m or greater.

To adequately manage the risk of falls RGM has 24 requirements. These need to be complied with unless exempt by a risk assessment and approval of the HSE Manager.

1. Each area owner is responsible for identifying the locations and activities that could result in an injury because of a different level fall.
 - a) Where personnel are required to work within 1.8 m of an opening where they could fall, they shall use guard rails or personal fall restraint equipment.
 - b) Where there is potential to fall more than 1.8 m, personnel shall wear appropriate personal fall arrest equipment.
2. All different level fall hazards greater or equal to 1.80 m requires completion of the Working at Heights Permit and Rescue Plan completed by fall competent person (see form RGM-F-07).
3. Whenever Working at Height is required, a person shall **not** work alone.
4. A documented risk assessment (JHA) shall be conducted before the commencement of work and every time the scope of work changes, or the risk of a fall increases.
5. For the correct usage of personal fall protection and fall restraint equipment and other working at height activities, proper training must be provided to the exposed employees. A competency-based training should be conducted to persons exposed to working at heights (contractors should provide training certifications for validation)
6. All personnel operating Elevated Work Platforms (EWPs) and work baskets shall be trained and qualified for the specific equipment they are using.

7. An Elevated Working Platform (EWP) (e.g., bucket truck, man-lift) shall only be used if it is manufactured and tested in accordance with OSHA/ANSI standards. Fall arrest equipment must be used and attached to the certified anchorage point.
8. Medical evaluation shall be used to examine people that are assigned for working at heights. Personnel who suffer medical conditions, such as epilepsy shall not be assigned to work from heights.
9. Single person anchor points shall be capable of withstanding 22.25 kN (5,000 lbs.). A qualified person must approve all certified or engineered anchor points (OSHA/ANSI standard)
10. D-rings and snap hooks should have minimum tensile strength of 5,000 lbs. and should be proof tested to 3,600 lbs (OSHA/ANSI standard)
11. All working at heights equipment shall comply and be used in accordance with OSHA/ANSI or CSA standards. (Fall equipment that do not comply to these standards or equivalent are **prohibited** to use at RGM)
12. Compatibility of all fall equipment is important and should be validated before use.
13. Only shock absorbing or retractable lanyards should be used in case of fall arrest (keeps impact forces to the body at maximum 1800 lbs/8kN).
14. Where movement during working at height is needed a dual (Y) lanyard system should be used to ensure that at least one connection point is attached.
15. Large plant and Mobile Equipment shall be provided with access ways with handrails and 3-point contact when accessing equipment. Fall restraint or fall arrest equipment should be considered when handrails are not installed.
16. A scaffold shall not be used unless build and inspected by a competent scaffold builder. Scaffold users should be trained in working at heights. For extended work a scaffold is recommended above ladders.
17. Lifeline systems must be designed and approved by a structural engineer or Fall Qualified Person.
18. Snap hooks are of the 2-movement locking type and should **not** be engaged as follows:
 - a) Directly to webbing, rope, wire rope
 - b) To each other
 - c) To D-ring that has another snap hook attached
 - d) To a horizontal lifeline
19. OSHA mandates that maximum free-fall distance should never exceed 1.8 m when calculating free fall distance. Always allow minimum of 1.8 m clearance above ground, equipment, etc., at end of fall from fall-arrest point.
20. It is mandatory for workers to use a helmet with chinstrap and suspension trauma straps when performing a task at heights.
21. A system shall be in place to prevent tools and other objects from falling from height. (e.g. toe plate, tool bags, wrist snaps).
22. Barricading and warning signage should be placed on all lower levels and areas where personnel or objects may land.
23. The fall rescue plan shall be used for the rapid retrieval of personnel in the event of a fall from height.
24. Quarterly documented inspection shall be done of all fall arrest equipment and ladders, conducted by a competent person and a register must be kept.

5. INSTRUCTIVE NOTES

Rosebel Gold Mines manages fall hazards according to the following method:

5.1 Identifying Fall Hazards

Each area owner is responsible for identifying the locations and activities that could result in an injury as a result of a different level fall. This is done through workplace inspections, review of incident reports, and review of industry best practices and / or codes of practice. In some situations, advice may be needed from technical specialists, such as structural engineers or fall qualified persons, to check the stability of structures or load bearing capacity.

5.1.1 Assessing the risk of a fall

Once identified the risk of a fall shall be assessed for likelihood and severity. Assessment must consider the existing controls and their control effectiveness. It should also be determined whether additional controls are needed and if so, what action needs to be taken.

5.1.2 Managing the risk of a fall

Once the risk of fall has been assessed as unacceptable or intolerable it is needed to control the risk using the hierarchy of control. Depending on safest, effectiveness, practicability, etc. a choice will need to be made. This choice need to be guided by, but not limited to, the following:

- Eliminate the risk of falling
 - Can the working at height be avoided or eliminated? For example doing the work at ground level.
 - Can the fall risk be eliminated by working from a solid construction? Solid construction means an area that:
 - is structurally capable of supporting workers, material and any other loads applied to it
 - is provided with barriers around its perimeter and around any openings from or through which a person could fall
 - has an even, accessible surface and gradient
 - has a safe means of entry and exit.
- Provide adequate supporting surface

Different types of work involve different loads on the supporting surface. The surface and its supports must be able to safely carry the expected loads, including workers, materials, tools and equipment. When in doubt, have a structural engineer determine the safe load capacity before use.
- Provide edge protection and / or barriers

When working at heights is unavoidable the next best control is providing edge protection or barriers.

These are used to prevent a person falling over edges and into holes. Examples of where edge protection can be used include:

- the perimeters of buildings or other structures
- mezzanine floors
- openings in floors
- the open edge of a stair, landing, platform.

The following shall be considered when designing and installing barriers or edge protection.

- The barrier should be designed and constructed to withstand the force of someone falling against it. **Guardrail systems shall be capable of withstanding a force of at least 200 pounds (890 N) in any outward or downward direction, with maximum deflection of 3”.**
- Edge protection shall consist of guard rails, solid balustrades, or other structural components, for example wire mesh supported by posts and provided with a reinforced top edge.
 - Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level (*see figure 2: height requirement guardrails*)
 - Mid rails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.
 - Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.

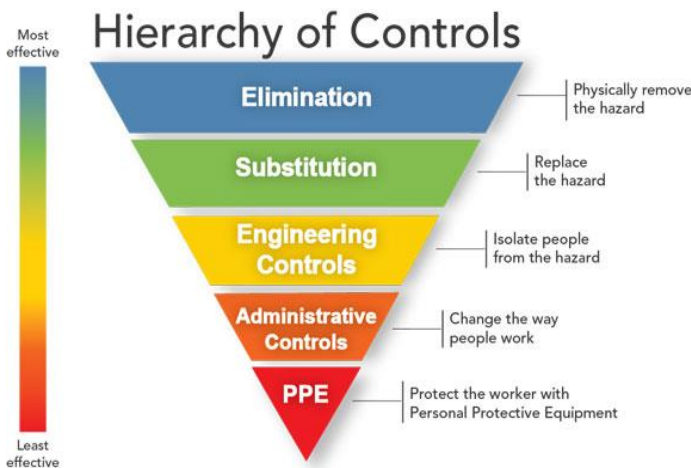


Figure 1: Hierarchy of control

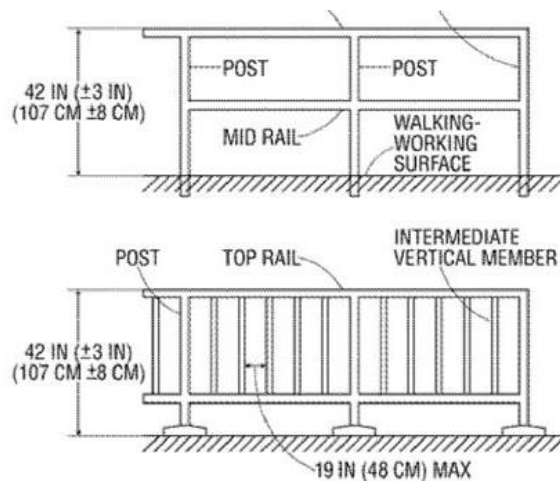


Figure 2: Height requirement guard rails

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		Date: 1 June 2023

If access is required to equipment (e.g. a hoist) it should be protected with gates, safety chains or other means to prevent a person falling.

- Protection of Openings

Holes, penetrations, and openings through which a person could fall should be made safe immediately after being formed. Every hole or opening larger than 2” is considered a hazard according to OSHA and appropriate measures should be in place to protect workers.

If a cover is used as a control measure, it must be made of a material that is strong enough to prevent persons or objects falling through and must be securely fixed to prevent any dislodgement or accidental removal.

- Surface and gradient

Surfaces of solid construction should be non-slip, free from trip hazards and should generally not exceed 7 degrees (1 in 8 gradient). Cleated surfaces, which provide greater slip-resistance, should not be steeper than 20 degrees (1 in 3 gradient).

If grid mesh or checker plate flooring is used for walkways and working platforms, ensure that:

- flooring panels are securely fixed and assembled in accordance with manufacturer’s specifications.
- where possible, they are fitted to the structure prior to it being lifted into permanent position.
- each panel is fixed securely before the next panel is placed in position.
- during installation, this type of flooring is secured by tack welding, panel grips or other means to prevent movement before being fixed permanently.
- if panels of grid mesh or checker plate flooring are removed, edge protection is provided, and the gaps left due to removed panels are protected.

- Entry and exit

The solid construction must have a safe means for people to get to, from and move around the work area, for example permanently installed platforms, ramps, stairways, and fixed ladders.

Ensure that fixed platforms, walkways, stairways and ladders are designed, constructed and installed according to a recognized standard (e.g. AS 1657).

Note: Cater for exposure of access systems to the weather (e.g., rain can make surfaces slippery and strong winds can cause loss of handgrip). Provide of adequate lighting to all access ways.

Ensure clearance of obstructions so that persons can move easily to and from the workplace (including during emergencies).

Suitable portable ladders should only be used where the use of safer systems is not reasonably practicable.

Before using a guard rail system, you should check that it will be adequate for the potential loads. The required load resistance will depend on the momentum of a falling person.

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	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

For example, the momentum of a person falling from a pitched roof will increase as the pitch (or angle) of the roof increases.

5.1.3 Fall Risk Control implementation.

Once controls have been identified, proper implementation shall be ensured:

- Health & Safety department shall develop procedures/ methods for correct installation use and maintenance (including inspection schedules).
- Health & Safety department shall provide competent, user and awareness training for employees and supervised contractors.
- Area department heads provide adequate supervision (span of control) commensurate with the risk and the competency level of the workers.

5.2 Use of fall prevention devices

A fall prevention device is any equipment that is designed to prevent a fall for temporary work at heights, and once in place does not require any further adjustment by workers using the device.

Everyone using fall prevention devices shall be properly trained in the safe use of these devices.

There shall be a system that ensures regular inspection (at least quarterly) of fall prevention devices.

5.2.1 Work platforms

A 'temporary work platform' is a working platform, other than a permanently installed fixed platform, used to provide a working area for the duration of the job. The design of the platform prevents workers from falling. Temporary work platforms include scaffolds, elevating work platforms, mast climbers, workboxes, building maintenance units, portable or mobile fabricated platforms or any other platform that provides a working area and is designed to prevent a fall.

Note on scaffolds.

A scaffold shall not be used unless a scaffold competent person provides written confirmation that the scaffold has been completed. The person must also ensure that:

- *the scaffold and its supporting structure are inspected by a competent person before use, after any incident that could affect its stability (such as a severe storm), after any repairs, and at least every 30 days*
- *unauthorized access is prevented on scaffolding that is incomplete and left unattended (for example, by attaching danger tags and warning signs at appropriate locations).*
- *all scaffold users shall be trained in scaffold builders and users training.*

5.2.2 Work positioning systems.

A work positioning system involves the use of equipment that enables a person to work supported in a harness in tension in such a way that a fall is prevented.

	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

Work positioning systems require a high level of competency on the part of the user and supervisors to ensure safe use. Users, including supervisors, should undertake a competency-based course of training.

5.2.3 Restraint technique

A restraint technique controls a person’s movement by physically preventing the person reaching a position at which there is a risk of a fall. It consists of a harness that is connected by a lanyard to an anchorage or horizontal lifeline. It must be set up to prevent the wearer from reaching an unprotected edge. Restraint techniques should only be used if it is not reasonably practicable to prevent falls by providing a physical barrier (for example, a guard rail). This is because restraint techniques require a high level of user skill to operate safely and greater supervision. Restraint systems are preferred above fall arrest systems (*see figure 3 Fall Hierarchy of Control*)

A restraint technique is suitable for use where:

- the user can maintain secure footing without having to tension the restraint line and without the aid of any other hand hold or lateral support.
- When deciding whether secure footing can be maintained, consider:
 - the slope of the surface.
 - the supporting material type.
 - the surface texture of the surface and whether it is likely to be wet, oily or otherwise slippery.
- the horizontal lifelines are fitted with an industrial shock absorber when required.

A restraint system SHALL be installed by a competent person in accordance with the manufacturer’s instructions. Restraint anchorage should be designed for fall-arrest loading.

An **individual fall-arrest system should** be used instead of restraint techniques if any of the following situations apply:

- the user can reach a position where a fall is possible.
- the user has a restraint line that can be adjusted in length so that a free fall position can be reached.
- there is a danger the user may fall through the surface, for example fragile roofing material.
- the slope is over 15 degrees.
- there is any other reasonably likely use or misuse of the system that could lead to a free fall.

5.2.4 fall arrest systems

A fall-arrest system is intended to safely stop a worker falling an uncontrolled distance and reduce the impact of the fall. This system must only be used if it is not reasonably practicable to use higher level controls or if higher level controls might not be fully effective in preventing a fall on their own.

All equipment used for fall-arrest should be designed, manufactured, selected, and used in compliance with the OSHA & ANSI standards. Always use the fall hierarchy of control when selecting fall restraint or arrest systems.

	<p style="text-align: center;">SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD</p>	RGM-SRCS-03
		Date: 1 June 2023

Personal fall-arrest systems rely on workers wearing and using them correctly, and therefore workers who will use such a system must be trained in its safe use. They shall only be used where it is not reasonably practicable to use higher level control measures. Personal fall-arrest equipment SHALL be permanently marked or labelled to indicate their purpose, correct use, limitations, and other relevant information aimed at reducing misuse of the equipment. **Body belts are prohibited to be used for fall arrest situations.**

Individual fall-arrest systems consist of some or all the following components:

- anchorages
- lifelines
- inertia reel
- lanyard of fixed length
- retractable lifelines
- rope grabs
- wire grabs
- rail system
- shock absorbers, both personal and industrial
- harness
- snap hooks (double or triple action to prevent rollout)
- karabiners (double or triple action to prevent rollout)
- Rescue equipment

5.2.5 Industrial rope access systems

Industrial rope access systems are used for gaining access to and working at a workface, usually by means of vertically suspended ropes. Although fall-arrest components are used in the industrial rope access system, the main purpose of the system is to gain access to a work area rather than to provide backup fall protection. Other methods of accessing a workface should be considered (for example, EWPs or building maintenance units) before rope access systems, as a high level of skill is needed for their safe use.

5.2.6 Industrial safety nets

Safety nets can provide a satisfactory means of protection while allowing workers maximum freedom of movement. They should not be used to enter or exit a work area or as a working platform.

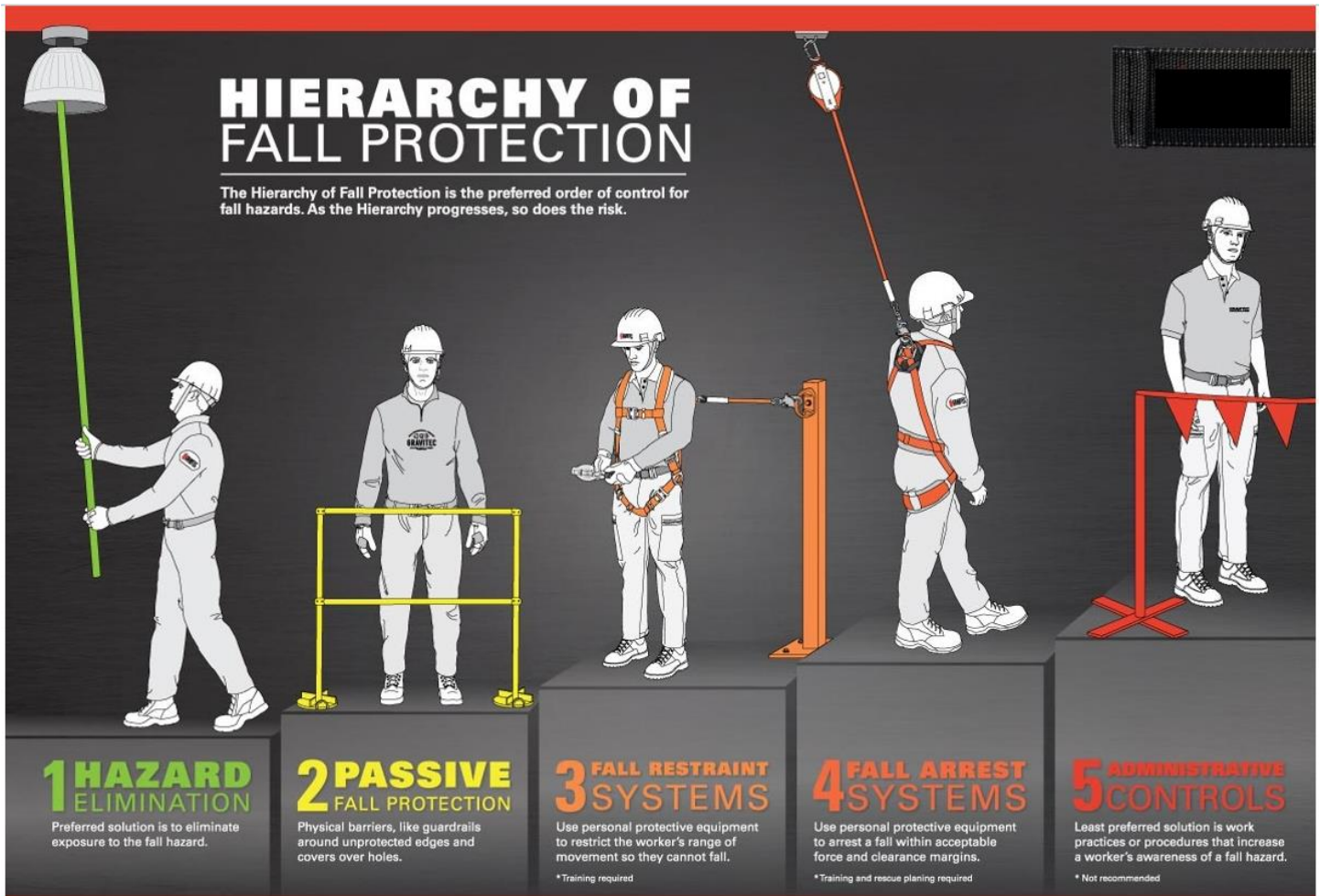


Figure3: Fall Hierarchy of control

5.3 Fall prevention system components.

Each component of the system and its attachment to an anchorage must be inspected by a competent person:

- after it is installed but before it is used
- at regular intervals (preferably quarterly)
- Immediately after it has been used to arrest a fall

Inspection of all components shall be conducted in accordance with the manufacturer's specifications and the RGM Fall prevention standard. If any signs of wear or weakness are found during the inspection, the components or means of attachment shall be withdrawn from use and disposed. Equipment shall be replaced with properly functioning components.

5.3.1 Anchorage points

Each anchorage point shall comply with the requirements of OSHA/ANSI standards. All anchorages shall be tested and approved by a Qualified person before use—a visual inspection may not reveal the structural integrity of the anchor point (i.e. the bolt may have failed below the concrete surface).

Each anchorage point should be located so that a lanyard of the system can be attached to it before the person using the system moves into a position where the person could fall. To have sufficient clearance all anchor point should be selected above the back-D ring of the harness.

5.3.2 Free fall distance

Fall-arrest systems, incorporating a lanyard, should be installed so that the maximum distance a person will free fall before the fall-arrest system takes effect is 1.8 m. There shall be sufficient distance between the work surface and any surface below to enable the system, including the action of any shock absorber to fully deploy. To work out whether there is enough distance available, you shall consider (*see figure 4 fall arrest clearance calculations*):

- the worker's height
- the height and position of the anchorage point
- the length of the lanyard
- any slack in the horizontal lifeline
- any stretching of the lanyard or horizontal lifeline when extended by a fall
- the length of the energy absorber when extended by a fall

Lanyards should **not** be used in conjunction with inertia reels as this can result in an excessive amount of free fall prior to the fall being arrested.

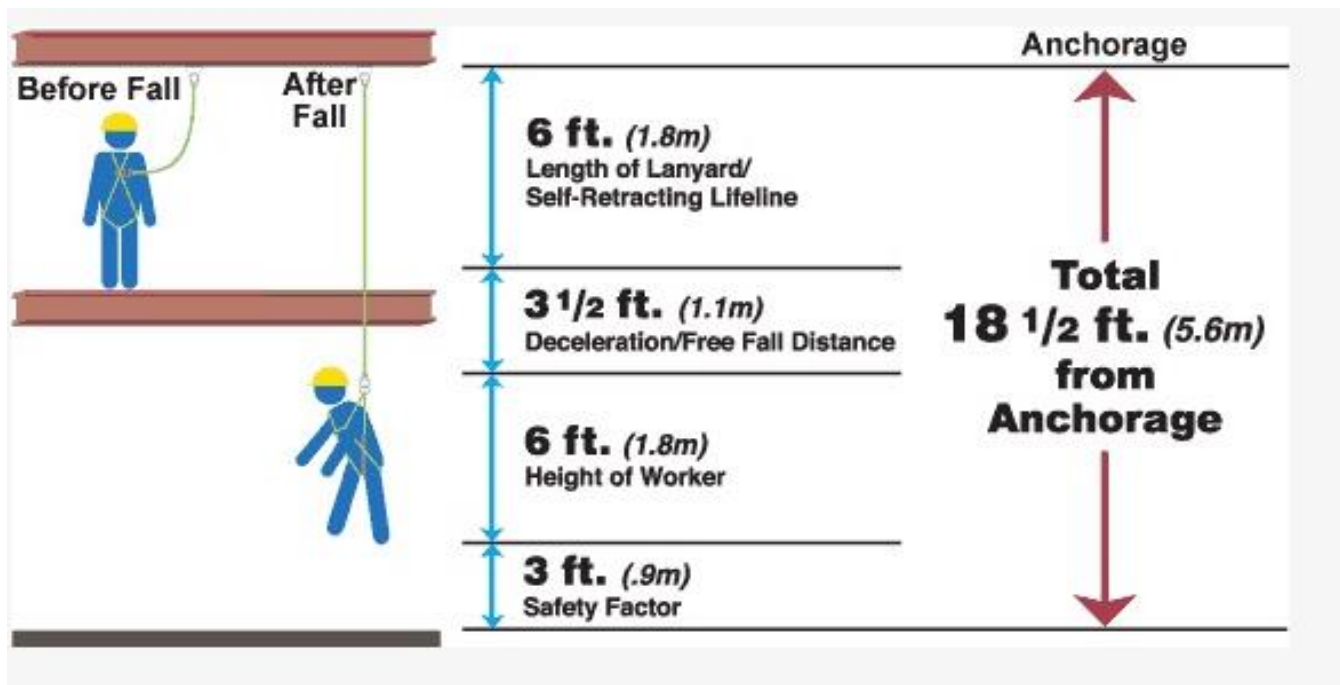


Figure 4: Fall arrest clearance calculations.

	SIGNIFICANT RISK CONTROL STANDARD FALL PREVENTION STANDARD	RGM-SRCS-03
		Date: 1 June 2023

5.3.4 Full body harnesses

In most cases, a full body harness shall be worn. Harnesses must be correctly fitted. Workers shall connect the fall-arrest line to the attachment point on their harness (dorsal attachment point or the chest connection) that will provide the best protection in the situation it is being used. Consideration shall be given to the potential fall distance, potential impact with the structure, body position after a fall and the need to interact with equipment such as rope-grabs.

5.3.5 Maintain minimum of slack in fall-arrest lanyard

There shall be a minimum of slack in the fall-arrest lanyard between the user and the attachment. The anchorage point shall be as high as the equipment permits. Avoid work above the anchor point, as this will increase the free fall distance in the event of a fall, resulting in higher forces on the body and greater likelihood of the lanyard snagging on obstructions. *(See figure 4: Fall arrest clearance calculations)*

5.3.6 Use inertia reels correctly

When considering the use of inertia reels, bear in mind that they might not be effective in certain situations. For example, if a worker falls down the inclined surface of a steeply pitched roof, the inertia reel line may keep extending from the reel—it may not lock.

Inertia reels shall not be used as working supports by locking the system and allowing it to support the user during normal work. They are not designed for continuous support. Where such lines are used, only one person may be attached to any one line.

5.3.7 Use compatible components

The use of non-compatible components may lead to ‘roll-out’ with some hook/karabiner configurations, resulting in injury or death to the user. The hazard cannot always be avoided by using components produced by the same manufacturer under the one brand name. If you are unsure whether components of a fall-arrest system are compatible you should contact the manufacturer for further information.

Snap hooks should be of the double action type, requiring at least two consecutive deliberate actions to open. Snap hooks should not be connected to each other as this could prevent the safe operation of the snap hook (for example, roll-out may occur). Some double action hooks are susceptible to roll-out. Screw gate karabiners or hex nut connectors may sometimes be appropriate. Further guidance is provided in OSHA/ANSI standards for fall protection.

5.3.8 Ensure prompt rescue in event of fall

Any supervisor who implements a fall-arrest system as a control measure for his crew SHALL establish emergency and rescue procedures. The rescue of a worker who is suspended in a full body harness must occur promptly to prevent suspension intolerance (ANSI mandates rescue within 15 minutes)

A worker should not use a fall-arrest system unless there is at least one other person on the site who can rescue them if they fall. Rescue plans must be approved by the RGM fire department. Rescue Plans must be issued and approved by Emergency Response Lead or designee as they may require rescuers to be standby at the work location.

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5.3.9 Hazards with individual fall-arrest systems

If a person using a personal fall-arrest system falls, the system may act as a pendulum, and in some situations the user may hit the ground (called 'swing down': *see Figure 5 Swing fall limitations*) or swing back onto the building or structure. Swing down can occur if the lanyard slides back along the perimeter edge of the roof until it is vertical. When this happens, the person may hit the ground, or the lanyard may break because of its contact with the edge of the roof. Measures to address 'swing fall' include:

- the installation of guard rails
- placing the anchorage point at a right angle to the position of the lanyard at the perimeter edge (for example, by using a mobile anchorage)
- the installation of a second anchorage point and belay devices (intermediate anchorages).
- Limit the horizontal travel from the anchor point according to picture below

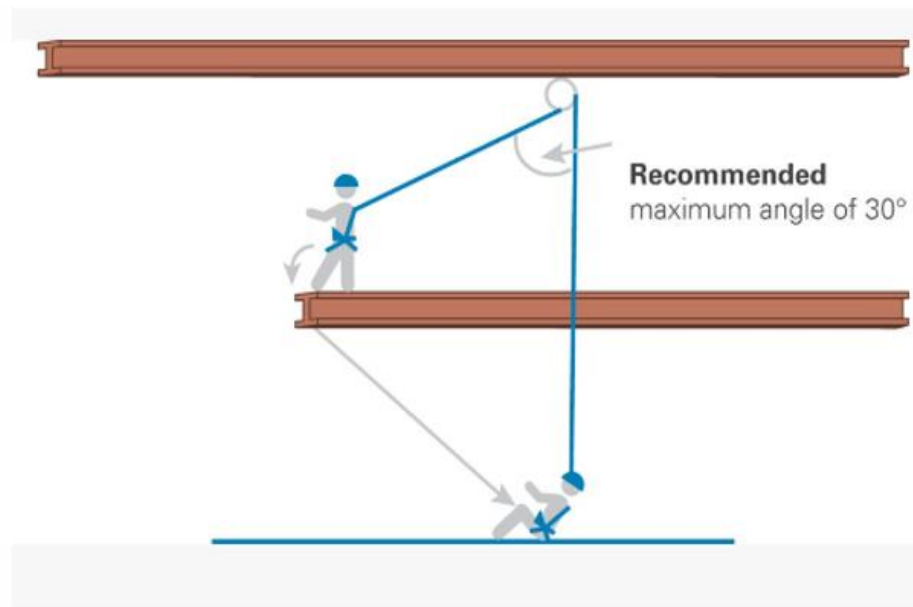
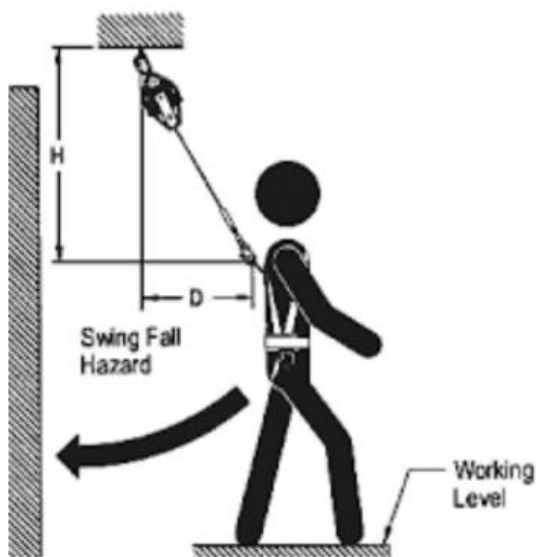


Figure 5: Swing fall limitations

5.3.10 Vertical and horizontal lifelines

Horizontal lifelines, anchorage lines; rails; vertical lifelines are temporary or permanent fall-arrest systems, which can be installed to provide continuous fall protection for persons using ladders or climbing towers or maneuverability on roofs. These can be used on plant, such as tower cranes, as well as buildings or structures.

Horizontal lifelines:

- Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.
- The lifelines shall be inspected by a qualified person prior to use.
- Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).
- Temporary systems comply with the OSHA/ANSI series of standards.
- Rescue provisions should be in place.

Vertical lifelines:

- The locking device is attached to the frontal attachment point of the harness and the lanyard assembly is a maximum of 300 mm length.
- the point of connection onto the ladder by the climber is near the base of the ladder to allow the connection before ascending begins and also to provide continuous connection to the disconnecting point when at a safe higher level
- free fall is limited to a maximum of 600 mm
- permanent systems are of wire or rail construction and are installed according to the manufacturer’s instructions.
- After a fall, remove the system from service and have it inspected by a qualified person before it is used again.

5.3.11 Double lanyards & self retracting lanyards

An alternative to anchorage lines or rails is the use of a double lanyard (also known as a twin tail or ‘Y’ lanyard). Whenever there is a need to climb or move horizontally or vertically a Y lanyard should be used. This provides the worker to move and remain attached to a structure.

However, double lanyards are easy to misuse—there should be no back hooking, they should not be wrapped around the body or passed between the legs, the chest connection should never be higher than the highest attachment point, they are not suitable for frequent use (because of possible misuse or muscle injury) and the ladder or structure points must be capable of arresting forces generated by a fall with the double lanyard. Adequate training should be provided on their use.

Self retracting lanyard

A self-retracting lanyard (SRL) is a vertical fall arrest lifeline that provides full freedom of movement for the user to undertake tasks. SRLs function a lot like a car seatbelt. The webbing or wire rope line is easily retracted to the maximum extension of 10 to 50 feet (depending on the model) and it remains under constant tension from the mechanism. In the event of a fall, the rapid pulling force on the line will cause the internal braking mechanism to engage. It works by using an internal centrifugal clutch assembly with pawls that engage with the teeth of the brake hub, stopping more line from being released and arresting the fall.

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Consider user of self retracting lanyard instead of regular lanyard if fall clearance is not sufficient (*see figure: 6 difference in clearance shock absorbing lanyard vs retractable lanyard*)

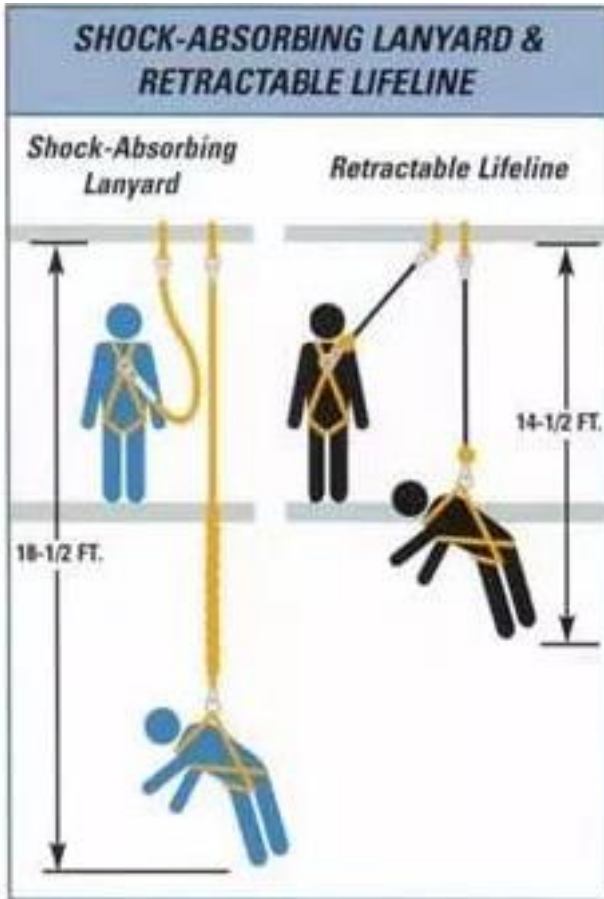


Figure 6 difference in clearance shock absorbing lanyard vs retractable lanyard

Safety considerations include that:

- An SRL is to be used as part of a complete fall arrest system.
- Always be trained on the proper use and selection of an SRL before using and use only inspected SRL's.
- Always verify the SRL is designed for your weight (most are designed for a person not weighing more than 310lbs, including tools and equipment). Always check manufacturer recommendation.
- Only one person may be connected to a single SRL at any time.
- Proper selection is key to determining acceptable fall clearance.
- Locking speed can be affected when working in confined spaces such as shifting sand or low-pitched roofs.

- Avoid creating a pendulum situation where you could swing into the ground or other objects. Whatever the height is above you, only travel half that distance either way.
- A clear path is required to arrest a fall.
- Additional precautions maybe required when working in hazardous environments (heat, extreme cold, sharp edges, corrosive chemicals, explosive or toxic gasses)
- A rescue plan should always be in place when using fall protection equipment.
- Do not disassemble the SRL or lubricate any of the parts. Always have it serviced by an authorized service center.
- Store the SRL in a cool, dry, and clean environment, away from direct sunlight. Thoroughly inspect SRL after prolonged storage.
- Always follow manufacturers recommendation when cleaning and storing
- If a subject falls, immediately take SRL out of service. If the fall indicator has deployed, return it to the manufacture.

6. LADDERS SAFETY

Ladders are primarily a means of access and egress. Many falls take place when people are working from ladders. You should consider whether an elevating work platform or scaffolding would be safer and more efficient.

6.1 Extension or single ladders

Extension or single ladders should generally only be used as a means of access to or egress from a work area. If ladders are used, they must be selected to suit the task to be undertaken. In doing this, you should consider the duration of the task, the physical surroundings of where the task is to be undertaken and the prevailing weather conditions. Ladders should have a load rating of at least 120 kg and be manufactured for industrial use. Any ladder used must be set up on a solid and stable surface and set up to prevent the ladder from slipping.

Where fixed or extension ladders are used for access or egress, you should check that (*See figure 7 safe use of extension ladder*):

- the ladder is in good condition—the ladder should be inspected for faults, such as broken rungs, stiles and footing before it is used – consider the material of the ladder also (no aluminium ladder for electrical work)
- there is a firm, stable work platform, free from obstructions, to step onto from the ladder.
- the ladder extends at least 1 m above the stepping-off point on the working platform.
- fall protection is provided at the stepping-off point where people access the working platform.
- Ladder is tied off and placed on a 4:1 angle.
- Always maintain 3-point contact when using the ladder (Two hands and one foot or two feet and one hand)

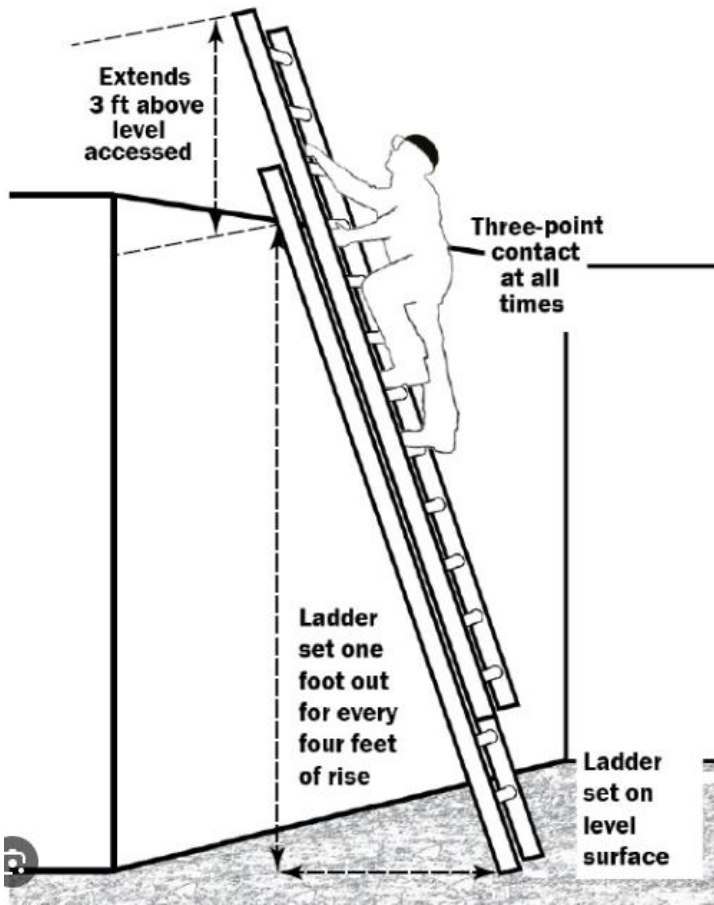


Figure 7: safe use of extension ladder

6.2 Step ladders

Where step ladders are used for access or egress, you should check that:

- Always follow manufacturer's instructions and the ladder label
- Verify if ladder has been inspected and quarterly inspection tag is readable.
- Face the ladder while climbing up and down.
- Keep slippery materials away from the ladder.
- Use barricade to keep traffic away from areas the step ladder is in use.
- Maintain a firm grip.
- Only put the step ladder on a stable and level surface
- Always maintain 3-point contact when using the ladder (Two hands and one foot or two feet and one hand)
- Check for and avoid overhead power lines.
- Avoid pushing or pulling stepladders from the side.
- Never work on the last wrung of the step ladder.

6.3 Fixed ladders

Fixed ladders should be installed in accordance with OSHA/ANSI standards (*see figure 8: fixed ladder with cage*) Ladder cages in fixed ladders do not stop a fall but simply funnel a fall and, in some cases, more injuries can occur from striking the protective back guards on the way down. The cages may also hinder rescue. Fixed ladders more than 20 feet (6.1 m) in height shall be provided with a cage, well, or ladder safety device.

Where fixed ladders are used for access or egress, you should check that:

- Fall protection is required on all fixed ladders that extend higher than 7.2 m. Previously, OSHA required cages for fixed ladders taller than feet.
- Cages are no longer considered compliant fall protection in newly installed or replacement fixed ladders extending higher than 7.2 m. To meet OSHA standards, a ladder safety or personal fall arrest system is required.
- As of November 19th, 2036, cages will no longer be accepted as a form of fall protection on any fixed ladder and all fixed ladders taller than feet high must use a ladder safety system or a personal fall arrest system.

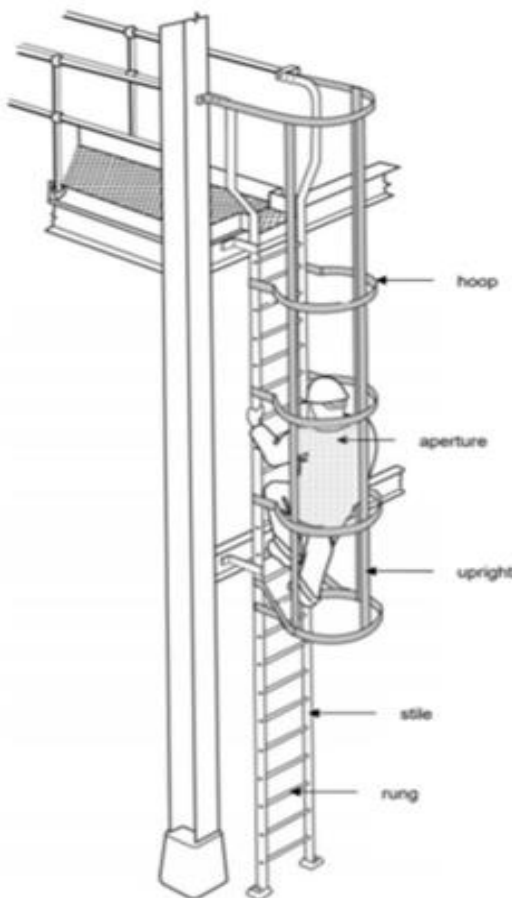


Figure 8: fixed ladder with cage

6.4 Ladder maintenance

Ladders should be regularly inspected by a competent person in accordance with the manufacturer's recommendations. Ladders with any of the following faults must be replaced or repaired:

- fibreglass stiles cracked, chipped, or severely faded with fibres exposed.
- timber stiles warped, splintered, cracked, or bruised.
- metal stiles twisted, bent, kinked, crushed or with cracked welds or damaged feet.
- rungs, steps, treads, or top plates that are missing, worn, damaged or loose.
- tie rods missing, broken or loose.
- ropes, braces, or brackets that are missing, broken or worn.
- timber members that are covered with opaque paint or other treatment that could disguise faults in the timber.
- missing, loose, bent or worn fasteners, i.e. rivets, bolts and pins
- worn or damaged feet, including non-slip material.

7. Fixed scaffolds

Scaffolding can be very effective protection in preventing falls; however, there are specific requirements that apply to some types of scaffolds. Scaffolding work platforms are generally rated as light, medium or heavy duty.

7.1 Safety considerations scaffolding

- scaffolding should be done conform to OSHA standards for scaffolding.
- all scaffolding is erected, altered, and dismantled by competent persons. Any scaffold from which a person or object could fall more than four metres must be erected, altered and dismantled by or under the direct supervision of a licensed scaffolder.
- prefabricated scaffolds are of the same type and not mixed components unless the mixing of components has been approved by the manufacturer.
- safe access to and egress from the scaffold is provided.
- edge protection (handrails, mid-rails and toe boards) is provided at every open edge of a work platform.
- Scaffold users should be trained in scaffolding builders and users.

7.2 Information, instruction and training for workers using scaffolds.

Where work is performed from a scaffold, you must ensure that the relevant workers understand:

- what loads the scaffold can safely take (maximum weight includes workers & material)
- not to make any unauthorised alterations to the scaffold (such as removing guard rails, planks, ties, toe boards and braces)
- that working platforms need to be kept clear of debris and obstructions along their length, and
- that incomplete or defective scaffolds must never be accessed.

7.3 Mobile scaffolds

Where work is performed using mobile scaffolds, workers should be trained to ensure the scaffold:

- remains level and plumb always
- is kept well clear of powerlines, open floor edges and penetrations.
- is not accessed until the castors are locked to prevent movement.
- is never moved while anyone is on it
- is only accessed using internal ladders.

8 Elevating work platforms

Elevating Work Platforms (EWPs) include scissor lifts, cherry pickers, boom lifts and travel towers. There are battery powered and internal combustion engine types. Some are designed for hard flat surfaces only, while others are designed to be operated on rough terrain.

Safety considerations include that:

- workers operating the platform are trained and instructed in safe operating procedures for the brand and type of equipment, as well as the safe use of fall-arrest equipment and emergency rescue procedures.
- unless designed for rough terrain, the platforms are used only on a solid level surface.
- the surface area is checked to make sure that there are no penetrations or obstructions that could cause uncontrolled movement or overturning of the platform.
- the manufacturers or supplier's instructions are consulted for information on safe operation.
- persons working in travel towers, boom lifts or cherry pickers wear a properly anchored safety harness.
- workers are licensed when operating boom-type elevating work platforms with a boom length of 11 metres or more.

9. EMERGENCY PROCEDURES FOR FALL

A supervisor who implements a fall-arrest system as a measure to control risk must consult the RGM fire department to establish emergency and rescue procedures. The procedures must be tested so that they are effective. Workers must be provided with suitable and adequate information, instruction, and training in relation to the emergency procedures. In developing emergency procedures, the different types of emergency and rescue scenarios that might arise should be considered. Information from the risk assessment will help in this task.

The emergency procedures for fall is incorporated into the emergency plan of RGM.

When establishing emergency plans, you should consider the following:

Relevant considerations	Questions
Location of the work area	Is the work at height being undertaken in a remote or isolated place? How accessible is it in an emergency and how far away is it from appropriate medical facilities? Can the rescue of a person after an arrested fall be provided immediately, without the need to rely on emergency services? Always use fall hierarchy of control when selecting the fall method.
Communications	How can workers working at height communicate in an emergency?
Rescue equipment	What kinds of emergencies may arise? The provision of suitable rescue equipment will depend on the nature of the work and the control measures used, for example, an emergency rapid response kit with man-made fibre rope, according to OSHA/ANSI standards— <i>Man-made fibre rope for static life rescue lines</i> . Selected rescue equipment should be kept near the work area so that it can be used immediately.
Capabilities of rescuers	Are rescuers properly trained, sufficiently fit to carry out their task and capable of using any equipment provided for rescue (e.g. breathing apparatus, lifelines and fire-fighting equipment)? Have emergency procedures been tested to demonstrate that they are effective?
First aid	Is appropriate first aid available for injuries associated with falls? Are trained first aiders available to make proper use of any necessary first aid equipment?
Local emergency services—if they are to be relied on for rescue	How will the local emergency services (e.g. ambulance) be notified of an incident? What is the likely response time?

9.1 Suspension intolerance

Suspension intolerance can occur with a fall-arrest system when a person has an arrested fall and is suspended in an upright, vertical position with the harness straps causing pressure on the leg veins. The lower legs' capacity to store large amounts of blood reduces the return of blood to the heart, slowing the heart rate, which can cause the person to faint. This may lead to renal failure and eventually death, depending on a person's susceptibility. This condition may be worsened by heat and dehydration.

The quick rescue of a person suspended in a full body harness, as soon as is possible, is vital. For this reason, workers should be capable of conducting a rescue of a fallen worker and be familiar with onsite rescue equipment and procedures. ANSI mandates that rescue should be conducted within 15 minutes after fall has occurred.

Workers and emergency response workers must be trained in the rescue procedures and be able to recognize the risks of suspension intolerance and act quickly in the rescue of a person.

To prevent suspension intolerance occurring because of an arrested fall, you should ensure that:

- workers never work alone when using a harness as fall protection.
- workers use a full body harness, which allows legs to be kept horizontal and head upwards.
- the time a worker spends in suspension after a fall is limited to less than 15 minutes. When a suspension is longer than 15 minutes, foothold straps/ suspension trauma straps or a way of placing weight on the legs should be provided.
- workers are trained to do the following when they are hanging in their harness after a fall:
 - move their legs in the harness and push against any footholds, where these movements are possible. In some instances, the harness design and/or any injuries received may prevent this movement.
 - move their legs as high as possible and the head as horizontal as possible, where these movements are possible.

9.2 Training for rescuers

The training for rescuing workers who have fallen should address the following factors:

- the rescue process should start immediately.
- training frequency should consider the worker's competence and their ability to retain competence through regular exposure to the equipment and skills needed to perform a rescue.
- workers should not put themselves at risk during a rescue.

10. DOCUMENT CONTROL

Document	Primary File Location	Frequency of Review/Update
RGM-PR-04 Fall Prevention	RGM-DMS	Annually
RGM-F-07 Permit to work: Fall Control Plan	RGM-DMS	Annually

If you have any comments, questions or requests for corrections regarding this document, please contact one of the signatories.

11. REFERENCES

- ANSI/ASSE Z359 Fall protection standard
- OSHA's standards:
 - Standard 1910.140 Personal fall protection systems;
 - Standard 1910.23 Ladders;
 - Standard 1910.27 Scaffolds;
 - Standard 1910.30 Training requirements;

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