Guidance Note QGN 28

Fall prevention

Mining and Quarrying Safety and Health Act 1999

December 2017

Queensland Government

Reference is made to the following legislation as applicable to a Mine or Quarry in Queensland:

- *Mining and Quarrying Safety and Health Act 1999*
- Mining and Quarrying Safety and Health Regulation 2017

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This publication has been compiled by Mineral Mines and Quarries Inspectorate of the Department of Natural Resources, Mines and Energy.

Contents

1 Purpose and Scope

This guidance note has been issued by the Mineral Mines and Quarry Inspectorate of the Department of Natural Resources, Mines and Energy.

It is designed to help mine workers identify fall hazards and select effective controls to minimise the risk of injury and death from fall-related incidents and accidents. This guidance note does not cover slips, trips and falls or worker/s falling at the same level.

2 Introduction

Mining operations inherently involve many activities where the hazard of falls exists.

Between 1990 and 2016 there were a total of 77 mining related deaths in the mining sector in Queensland. Of the deaths 36% were related to persons falling from height, being hit by falling materials, and mobile equipment operators driving into mine openings or over bench edges. Incidents involving falls, as a collective, make up over 10% of all high potential incidents (HPI's).

This Guidance Note applies to the identification of fall hazards, the development and implementation of controls to manage the hazards to persons from falling from height, fall of plant, being hit by falling material and fall of suspended loads.

3 Falls Risk Management - Recognising and Understanding the Hazards

The following sections provide guidance on how to apply effective risk management principles to the four main fall scenarios namely fall of worker, fall of plant[1], fall of material and fall of a suspended load.

Fall hazards should be considered as part of the identification of primary hazards at a mine. The risk management approach used must consider all fall scenarios and controls necessary to ensure the risk is as low as reasonably achievable (ALARA). The selection and implementation of effective controls is an important part of the risk management process. Controls identified must be implemented and monitored for their actual (not perceived) effectiveness.

The scope and context of fall risk assessments should focus on identifying all potential fall scenarios, and appropriate and effective controls.

During the conduct of the risk assessment, even if a scenario has never occurred at the mine, the scenario should still be considered as possible to occur.

Because of the known high consequence, measures to reduce risk should ideally be focused on controls that eliminate or engineer out the hazard. A suitable risk assessment method should be used to achieve this.

When undertaking a risk assessment:

- Consider the use of a trained facilitator.
- Ensure that a systematic approach is undertaken.
- Apply and reference the applicable legislative requirements.
- Reference relevant information and Standards.

[1] Refer to *Mining and Quarrying Safety and Health Act 1999*, Schedule 2 – Dictionary for meaning of Plant

4 Fall of Worker

The Site Senior Executive must ensure that where a person works at a height of greater than 2.4m appropriate controls are in place to minimise the risk of a person falling[2].

The mine should identify the many scenarios where a worker may fall from height resulting in injury or death, and identify and implement appropriate controls.

The following briefly describe scenarios where falls of a worker may occur:

- From height.
- Off mobile plant.
- Over an edge.
- Into a void.
- From a structure.

General management of this hazard may follow the fall of worker 5-level control approach as detailed in Appendix 1, namely:

Level 1 - Eliminate the need to work at height wherever possible.
Level 2 - Work behind engineered guardrails or other passive fall protection devices
Level 3 - Fall restraint.
Level 4 - Fall arrest.
Level 5 - Only then consider other procedural controls.

For example controls may include:

- Safe access and egress to and from the work location where access from the same level is not possible.
- Fixed ladder ways incorporated into the plant design.
- Access to the work area via an inclined stairway rather than a vertical (or near vertical) ladder.
- Apply fixed static lines and enclosures to vertical (or near vertical) ladders.
- Installation of permanent or temporary handrails, restraints or edge protection to prevent a person from falling over an edge or opening.
- Illumination of work areas and walkways.
- Exclusion zones should be well defined and may be delineated by bunds, bunting, cones, signs and barricades etc.
- Use of fall arrest or fall restraint equipment and systems by workers who have been assessed as competent in its use.
- Maintenance, including structural integrity inspections / audits by competent people, to ensure the functionality and integrity of controls are maintained.
- The safe working load and condition of ladders and platforms should be verified before use.
- Attachment points for harnesses should be rated, suitable for attachment, clearly marked / identified and be inspected.
- A rescue and retrieval plan based on the task.
- Audits and workplace inspections to verify controls are in place and effective.

All fall arrest and fall restraint equipment and systems used by workers should be inspected to ensure that they are fit for purpose prior to use. Refer to Appendix 2.

The following incidents involved falls of workers:

- *A maintainer fell from the rear wheel mudguard of a Caterpillar 776D truck when he stepped on it and it moved unexpectedly. He initially landed on his feet but then fell back onto his tailbone. He was transported to hospital for a precautionary X-ray.*
- *While exiting an excavator, the operator missed a foot hold and fell to the ground.*

[2] Mining and Quarrying Safety and Health Regulation 2017, section 49

5 Fall of Plant

There are many scenarios where plant may fall from height resulting in injury or death. Plant includes fixed plant, mobile plant, equipment, components of plant and tools. The mine should identify the scenarios where this may occur. With fall scenarios identified, appropriate controls need to be identified and implemented.

The following briefly describe fall of plant scenarios which may occur from operating plant near:

- Unstable ground.
- Edges or drop-off (e.g. crest of a mine bench, waste dump, stockpile etc.).
- Open voids.

Controls addressing the above may include:

- Roads near an edge are suitably bunded.
- Not tipping over an unprotected edge (tip short and push to the edge.).
- Do not tip above any loading out operations which may be occurring below.
- Install stop logs or bunds along an edge to stop an impacting vehicle. The design should consider:
  - Type of material used for its construction.
  - Height.
  - Proximity to the edge that it is protecting.
  - The type, size, weight and speed of mobile plant used in the area.
  - An engineered design.
- Provide suitable means for plant operators to safely determine the proximity of an edge.
- Work area lighting.
- Audits and workplace inspections to verify controls are in place and effective.

Other fall of plant scenarios may also include:

- Structural failure (e.g. overhead services, bins, conveyors etc.).
- Detachment of items from plant (e.g. man basket, bucket etc.).
- Objects being dropped from height (e.g. plant components, tyres, materials, pipes, hand tools etc.).

Controls addressing the above may include:

- Appropriate design and application of an effective maintenance program.
- Ensure plant attachment locking mechanisms are used and function as designed.
- Use of tie downs, restraints, tool lanyards and fall netting installed under the work area.
- Delineation of and exclusion zone for the work area below.
- Audits and workplace inspections to verify controls are in place and effective.

The following are incidents involving plant falling from height:

- *A loader operator sustained fatal injuries when the mucking unit he was operating entered an open bench stope void. At the time of the incident, the operator was delivering backfill to the underground bench stope and tipping over a solid edge. He entered the stope from the fill point (top of the bench) and the unit came to rest on a rill at the base of the stope; a fall of approximately 20 m.*
- *While preparing to dump a load of material on a bench to level a drill pad, a rear dump truck reversed over the edge of the bench and fell 15 m. The operator sustained serious injuries.*
- *A bracket supporting a 25 mm fire water pipe failed. As the weight shifted, other brackets failed causing several lengths of pipe to fall 7 m to the ground below.*

6 Fall of Material

The mine should identify the many scenarios where material may fall from height resulting in injury or death, and identify and implement appropriate controls.

Scenarios where falls of material may occur at surface and underground mines may include:

- Material such as rocks falling from the roof / backs, face or sidewall of an excavation.
- Material displacement or slumping from benches, stock piles or waste dumps.
- Material being ejected from a stope or bin chute.
- Uncontrolled release of material from height off a conveyor belt, out of a tank or as a mud or fill rush.

Controls addressing the above could include:

- Develop and maintain the mine using safe mine design, planning and operational practices, e.g. ground control management plans incorporating trigger action response plans (TARPs).
- Design and implementation of suitable ground support systems.
- Use ground movement monitoring systems (e.g. cross crack measurement, survey and seismic monitoring etc.).
- Blast and excavation design resulting in minimising rock damage and excessive ground vibration.
- Scaling of faces, backs and sidewalls.
- Consideration of material bunds and using competent buttressing material to confine potential rock falls or slumping ground.
- Not undercutting mining faces, material in draw-points or stockpiles.
- Design of conservative stand-off distances from faces and benches.
- Design and maintenance of catch areas for falling material.
- Management of water, mud or other fluid medium to prevent build-up and uncontrolled release.
- Use of remote control machines.
- The accurate survey and mapping of all current and previous mine workings, back filled areas, voids and geological structures to assist in identifying potential ground issues and sources of ground water.
- Checking and remediation of over break, back and sidewall conditions before entering any area.
- Systematic inspection and monitoring of ground support systems (quality control) including pillar conditions and rehabilitated areas by a competent person.
- Recognition that a void may not actually be filled due to undercutting but may appear tight filled.
- Back filling, tight filling and curing processes to reduce ground movement and resultant ground failure.
- Draw point management to prevent undercutting of broken ore, waste rock or fill.
- Specific training for all workers to recognise ground control hazards and implement effective controls.
- Do not work above each other unless effective controls are in place to prevent materials falling onto workers below. Exclusion zones need to allow for deflection of falling items.
- Process to access any potentially unsafe area (drop zone) from a known safe area.

The following are examples of incidents involving material falling from height:

- *A worker was on the ground charging a development face when a rock has fallen from the face and struck him on the head and limbs. The worker sustained lacerations to the head, a broken collarbone, two fractured ribs and was transported to hospital.*

- *Excavator operator was preparing to load a sandstone block (approx. 8.9 t) onto the dump truck, lost control of the oversized block during the loading process and the block then fell onto the cab of the excavator. The operator sustained small lacerations to both legs from broken front screen. Major damage to excavator cab.*
- *During underground inspections, a worker came to a 'No Entry Unless Authorised' sign. The worker subsequently left the area, as radio signal was poor, to obtain information regarding the sign and gain permission to access the area. Upon returning to the drive, the area had dusted out and it was noted that approximately 100 t of ground had fallen from the side wall.*

7 Fall of Suspended Load

The mine should identify the many scenarios where lifting activities may result in injury or death, and identify and implement appropriate controls. Scenarios where suspended loads could contribute to adverse outcomes at mines may include:

- Incorrect lifting equipment selection – cranes, hoists, winches and associated lifting equipment.
- Use of defective, damaged or underrated lifting equipment.
- Placement of the crane, hoist or winch.
- Lifting unstable or unsecured loads.
- Unsafe slinging technique or work practices.
- Incorrect load weight assessment.
- Failure to identify, maintain and work from a safe exclusion zone.
- Absence or deficiency of risk assessment or lift plan prior to commencing a lift.
- Lack of implementation of critical control measures identified in the risk assessment and lift plan.
- Insufficient training and supervision.
- Use of non-rated plant for lifting e.g. loaders and excavators.
- The use of under rated or inappropriate lifting points.

Controls addressing the above could include:

- **Selection of lifting equipment**

  The risk assessment associated with the selection of lifting equipment may cover:

  - All lifting equipment meets the requirements of the relevant standards.
  - The actual mass of the load to be lifted. Original Equipment Manufacturer (OEM) documentation should be referenced to aid in the understanding of the anticipated weight and weight distribution.
  - Suitability of the crane, winch, chain block hoist or other device to be used to carry out the lift.
  - The number, length and type of slings required to perform the lift safely.
  - Identification, access and integrity of lifting points.
  - Compatibility of fittings (e.g. shackles).
  - Ability of lift equipment to withstand abrasive wear during the lift.
  - Only lifting equipment and accessories with legible identification and current inspection tags should be used. The selection should also consider the maintenance history of the equipment.
  - Use of a person competent in dogging and rigging work in the risk assessment process and during the conduct of the lift.
  - Consider the presence of hazardous chemicals and / or substances which may cause damage to or affect the safe use of lifting equipment.

- **Safe Lifting Practices**

  Competent people must observe the following safe lifting practices. This may include:

  - Ensuring equipment is rated for the task and installed as per the lift plan.
  - Inspect equipment for damage such as inoperable safety latches, cracks, stretching, cuts and crushed components.
  - Protection against cutting and abrasion while lift is performed.
  - Securing of shackles against unscrewing (e.g. mousing or similar).
  - Chains and slings are not twisted.
  - Hammer locks and connecting links are secure.
  - All components being used during the lift are fitted with a current test tag.
  - Slings and chains are restrained to prevent slippage.
  - Where multiple slings are used that the load is balanced on each sling.
  - Ensure the load is not lagged, clamped, or bolted to the floor.
  - Guarding against shock loading.
  - Check the tension on each leg of a sling.
  - Consider the effect of 'angle of lift'.
  - Always lift vertically, and check obstructions in the lift path.
  - When lifting a load watch the lifting equipment carefully for signs of strain.
  - Use a load cell where possible to ensure that the lifting device is not overloaded.
  - Keep all personnel clear of the drop zone while the load is suspended.
  - Crane or hoist operators should watch the load at all times when it is in motion.
  - Prepare the site where the load is to be landed in advance of the lifting activity.
  - Make sure that on completion of moving a load, the sling can be removed by hand, all materials are securely and safely stacked and there is adequate clearance for people, machinery and emergency services.
  - Once the lift has been completed, clean the sling, check it for damage, and store it in a clean, dry, ventilated location.
  - Consideration of material or contents that may be in or on the load to be lifted (e.g. tank or pipe work that contains material or excretion).
  - The nature of the plant to be lifted and any components which could detach during the lift.

Consider the 'Nevers' associated with lifting:

- Never shorten slings by the use of knots, sewing, twisting, kinking or other means.
- Never allow more than one person to control a lift or give signals to a crane or hoist operator except to warn of a hazardous situation.
- Never overload the sling – check the Working Load Limit (WLL) on the identification tag and consider the load angle.
- Never raise the load higher than necessary.
- Never leave the load suspended in the air.
- Never work under a suspended load or allow anyone else to and ensure an exclusion zone has been identified.
- Never use slings or accessories to lift which do not have a manufacturer's tag / identification that includes details of the WLL.
- Never use a sling which does not have a current inspection tag attached.
- Never use tow chains or ropes to lift a load.
- Never allow anyone to ride on the load.
- Never conduct a lift under a power line.

The following are examples of incidents involving fall of suspended load:

- *An articulated mobile crane was lifting a vertical drive sump pump. The pump fell from the crane hook when one of two synthetic-webbing slings used in the lift came off the hook. The pump struck a worker standing nearby causing fatal head injuries.*

- *A suspended concrete culvert (5 t) was slewed over a worker who was in the trench waiting to assist in positioning the culvert as it was lowered into position.*
- *As a crusher manganese mantle was being lifted with a crane to turn it over, the lifting lug broke off and the mantle fell onto the left foot of the supervisor of the lift. The worker was taken to hospital and subsequently had toes amputated.*

8 Training and Assessment

All mine workers, as part of their induction, general training and ongoing refresher training, must receive specific training and education in the recognition and effective management of fall hazards as they relate to the tasks they will undertake.

The mine's safety and health management system must identify the training and assessment standard required. As a minimum standard, industry training packages should be referenced and adopted into the mine's training program. Training should also highlight the importance of communication between workers and workgroups as an essential element of safe work outcomes (e.g. in situations where work is being performed above other workers).

9 Fall Scenarios

An important part of fall related hazard management is the collection and accurate description of all foreseeable fall scenarios on a mine.

Generalisation of scenarios should be avoided - some scenarios may look similar, but the controls to prevent a fall exposure may be different in each situation.

Typically fall hazards are present in the following work areas, tasks or situations:

- When working near the toe or crest of a bench - e.g. people or machines falling over the crest, falling rocks near the toe of a bench, geotechnical slope failure, tip heads, stockpiles, dumps and ramps.
- Underground when working in or near ore passes, stope edges, shafts, sumps and open brows.
- Underground when clearing hang-ups in ore passes, chutes and bins.
- Fall of ground in underground development or stoping.
- When working under unsecured equipment or material - e.g. brick or block walls, mesh and drill rods.
- When working in or near open excavations, sumps and trenches.
- Off mobile or fixed plant or equipment – e.g. access / egress, maintenance work / pre-start inspections.
- Cranes, Lifting equipment, Elevated Work Platforms, Telehandlers - e.g. in, on or around equipment and plant that is being disassembled or repaired.
- Ladder ways, walkways, platforms.
- Scaffolds - e.g. assembly, access, working on, and disassembly.
- Structural collapse - e.g. plant and buildings.
- Walking under or working near a suspended load.

It is important that all fall locations and scenarios are identified and that effective controls have been implemented before the commencement of the task. Sample check questions that may be used when considering a fall scenario in a risk assessment include:

- Is there any risk of falling on the structure being constructed, installed, modified, inspected, tested, maintained, repaired or cleaned?
- Are persons working from plant that is used to gain access to an elevated level (e.g. man basket, EWP)?
- Is the area people are working in poorly lit?
- Are people working:
    - On or near potentially fragile surfaces such as cement sheeted or rusty roofs, fibreglass sheeting or skylights?
    - Near potentially unstable areas such as backfill or tops of stacks?
    - On any working at heights equipment such as portable or mobile or fixed ladders, scaffold, work platforms etc.?
    - On sloping or slippery surfaces?
    - Near unprotected open edges or floor openings?
    - Near openings in the ground – shafts, ore passes, open stopes, roof openings, wells, trenches etc.?
    - In areas with poor housekeeping and clutter?

If the answer to any of the questions in Section 9 is 'yes' or 'potentially yes', fall prevention controls must be implemented. Controls must be in place before the tasks starts, and both workers and supervisors must monitor the task to ensure controls remain in place and effective. Additional prompts have been included in Appendix 3.

10 Developing and Implementing Effective Controls

It is important to identify the critical controls that will prevent a fall related event and how to monitor the controls for their effectiveness and reliability.

A control that is crucial to preventing the event or mitigating the consequences of the event is a critical control.

A critical control is defined as a control that if removed or not executed exactly as intended, would cause an unsafe situation despite the existence of the other controls.

Steps in identifying critical controls are:

1. Identify likely scenarios.
2. List all controls.
3. Identify critical controls (see definition above).
4. Develop a risk assessment using the above information.
5. Use the risk assessment to check that appropriate controls, including critical controls, have been identified to mitigate the fall hazards. If not, review controls and return to step 3.
6. Identify processes to ensure controls are monitored for effectiveness.
7. Responsibilities for implementation and monitoring have been allocated to a person(s).

Examples of monitoring the effectiveness and reliability of controls may include, but not be limited to:

- Workplace inspections and task observations taking into consideration
    - Risk assessments.
    - Training and assessment material.
    - Work Procedures.
- System audits that include auditing of the effectiveness of falls process/s.
- Reporting and analysis of near misses.

An incident investigation is a trigger to review the effectiveness of the current fall hazard controls.

Coronial Recommendations

The following are recommendations summarised from Coronial mine inquiries. Many controls are applicable across a range of fall scenarios:

- All mine workers, as part of their induction, and ongoing training, should receive specific training and education in hazard recognition and effective management of fall risk.
- Work procedures must be risk based and consider potential fall hazards, and where applicable include effective means to prevent or mitigate fall incidents and accidents.
- If work includes demolition or modification, structural sections should be tethered and secured by fit for purpose (FFP) equipment slings, shackles etc., and all openings should be covered by FFP covers to prevent workers falling through them.
- All persons working at height are required to wear safety harnesses attached to approved anchor points.
- Introduce a method to track work on equipment or structures.
- All sites, as part of their single SHMS, must carry out planned audits of their system to ensure that fall risk mitigation is effective at site. Such audits must also extend to all contractor organisations working on site.

11 Emergency Preparedness / Response

It is probable that a person involved in a fall could be injured and may not be able to self-rescue. Therefore with any working at heights task, or task with a falls risk of any kind, consider rescue preparedness and effective arrangements as they are an important part of any fall safety management plan.

Reasonably foreseeable fall scenarios must be considered and form part of the mines emergency response plan and associated procedures.

12 Appendices

Appendix 1 - Fall of Worker 5-level Control

When applying a hierarchy of controls in relation to falls it may be useful to consider the fall-specific control approach, as illustrated by Figure 1.

Figure 1 - Hierarchy of Control - People falling from heights prevention.

Level 1 - Elimination

Wherever possible work should be planned and organised so that it can be undertaken on level ground or a firmly constructed base without the need to work at any height. Ideally the location of service or inspection points, energy isolation points, or access to ancillary equipment should be at the same level as the work to be carried out.

However recognising that elimination in the mining environment may not always be achievable or practicable then the effective application of level 2 controls becomes a key element in the control of fall hazards and associated risk.

Level 2 –Guardrails

Where work needs to be performed above normal floor levels, it should be done behind passive fall protection devices and installations. These include physical barriers which, under normal circumstances, would prevent a person or a piece of equipment falling over an edge.

A passive fall protection system is a system that is non-dynamic (static), stationary, and does not move, adapt, or change when in or out of use. Typically, passive systems include handrails, guardrails and netting. The inclusion of passive systems in the workplace is best considered at the design stage. As active adjustment or input from the worker is not required, these systems are generally more error tolerant.

Passive fall protection systems also include scaffolds and its fixed railings, engineered guard railing, perimeter screens and fencing, stop logs, bunds and other means of edge protection, and elevating work platforms (EWPs) equipped with railings around the work platform.

Level 3 – Fall Restraint

This includes work using a work-positioning system such as a travel restraint system or industrial rope access system connected to a secure anchorage point with a lanyard.

The basic principle of a fall restraint system is that the restraint system does not allow the person to get close to any unprotected edge thereby preventing the fall.

Fall restraint systems typically use a fixed-length lanyard to keep a worker's centre of gravity from going over a fall hazard leading edge.

Level 4 – Fall Arrest

Fall arrest systems include catch platforms, or safety harness systems. This would also include lanyards to secure or arrest tools from falling. Such systems are sometimes also referred to as active fall protection systems.

Essentially, fall arrest systems are similar to fall restraint systems but allow the person to work near or over an unguarded edge, and will break his fall safely should the person fall off the edge. Unlike passive systems, active fall protection systems are dynamic and require the use of special equipment.

Fall arrest systems incorporate various types of lanyards, connected to an anchorage point, including rip stitch lanyards (shock absorber) designed to slow down the fall and or stop a freefalling worker from impacting a lower level.

Because of the likely difficulties with retrieving a person after a fall (injury, entanglement), fall arrest systems should incorporate suspension trauma straps and a written rescue plan is required.

Level 5 – Other Systems

Only if no other practicable control measure can be identified should administrative or Level 5 controls be considered by way of risk assessment. This is the least preferred option and therefore their use should be carefully considered and a written rescue plan is required. Such plans are particularly important where people may work by themselves and where self-rescue is not realistic. Where ever possible, administrative approaches (Level 5) should be avoided.

In choosing any approach, it should be noted that Level 1 and 2 systems and risk controls (passive) do not require specific training, making these essentially human error tolerant regardless of the workers experience, training or state of mind. This improves the fundamental value of these controls and dramatically reduces the risk workers are exposed to.

Appendix 2 - Checking of Fall Arrest Equipment and Installations

While all fall protection equipment and installations should be checked before, during and after use for absence of damage and suitability for the task, checks of personal fall arrest equipment such as safety harnesses, lifelines, connectors, anchorages, fall arrest harnesses, fittings and life lines should be more thorough.

All fall protection equipment should be checked by the manufacturer or authorised person (and recorded) in line with manufacturer's guidance. This check should also ensure the equipment is tagged.

The following simple prompt **A.B.C.D.E** may also help workers to remember the critical checks when using fall prevention and arrest systems. **A.B.C.D.E stands for:**

- **Anchors** – check the integrity and appropriateness of all anchor points used.
- **Belts and Buckles** – check webbing for wear and tears, fraying, abrasion, burns, chemical contamination, check that all buckles can be adjusted and will hold firm when pulled. Make sure all buckles have been closed properly and that they are double backed before climbing.
- **Connectors** (e.g. carabineers) – check all carabineers and load bearing connections for wear and tear, damage, twisting, and that the carabiner gate is locked off (secure) before climbing or applying any force to it.
- **Devices** – check all climbing (ascending, descending, arrest) devices for wear and tear, damage, twisting etc. Ensure they are clipped in properly and secured, and you know how to use them correctly.
- **Ends, edges and equipment, everything else** – all rope ends should be secured, e.g. through tying them off securely into an approved anchorage point, so they cannot accidentally slip through and cause a person to fall. Sharp edges that harness equipment can be damaged on should be protected. Check that the person / team has taken effective steps to prevent any tools or equipment from falling by securing with lanyards where appropriate. Also, before the task is started, the person / team and / or supervisor should check that all harnesses are fitted with suspension trauma straps and that the team know how to use them. Consideration should also be given to the establishment of a rescue plan and the rescue plan should be communicated to all stakeholders.

Appendix 3 - General Fall Hazard Checklist

Key things to check at the workplace may include:

- Surfaces:
  - The stability, the fragility or brittleness, the slipperiness (e.g. where surfaces are wet, polished, glazed or oily in the case of new steelwork).
  - The safe movement of employees where surfaces change.
  - The strength or capability to support loads.
  - The slope of work surfaces (e.g. where they are steep).
- Levels (where levels change and employees may be exposed to a fall from one level to another).
- Structures (the stability of temporary or permanent structures).
- The ground (the evenness and stability of ground for safe support of scaffolding or working platform).
- The raised working area (whether it is crowded or cluttered).
- Scaffolding (the correct erection and dismantling).
- Edges (edge protection for open edges of floors, working platforms, walkways, walls or roofs).
- Hand grip (places where hand grip may be lost).
- Openings or holes which will require identification or protection or unguarded shafts or excavations.
- Proximity of employees to unsafe areas:
  - Where loads are placed on elevated working areas.
  - When objects are below a work area, such as reo bars and star pickets.
  - Where work is to be carried out above workers (e.g. potential hazards from falling objects).
  - Power lines near working areas.
- Movement of plant or equipment (ensuring there is no sudden acceleration or deceleration).
- Access to, egress from and movement around the working area (checking for obstructions).
- Safe access to, egress from mobile plant.
- Working on or accessing mobile and fixed plant for maintenance purposes.
- Manual handling (checking safe work practices for carrying awkward materials, such as plaster boards and roof sheeting, which may be caught by the wind).
- Lighting.
- Weather conditions (when heavy rain, dew or wind present).
- Footwear and clothing (suitability for conditions).
- Ladders (where and how they are being used).
- New or inexperienced employees (i.e. employees unfamiliar with a task).

13 References and Publications

References

- Queensland *Mining & Quarrying Safety and Health Act 1999*.
- Queensland Mining and Quarrying Safety and Health Regulation 2017.

Safety publications

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- Government of Western Australia Department of Mines and Petroleum. Guideline Working at Height in Underground Mines. 2014

Standards

- AS 1657 Fixed Platforms, walkways, stairways and ladders.
- AS 1353 Flat synthetic-webbing slings.
- AS 1438.2 Wire-coil flat slings - Care and use.
- AS 1666 Wire rope slings.
- AS/NZS 1891 Industrial fall-arrest systems and devices.
- AS 2089 Sheave blocks for lifting purposes.
- AS 2318 Swivels for lifting purposes.
- AS 2321 Short-link chains for lifting purposes.
- AS 2741 Shackles.
- AS 2759 Steel wire rope.
- AS 3775.1 Chain slings for lifting equipment –Grade T (80) and V (100) – Product specifications.
- AS 3775.2 Chain slings for lifting purposes –Grade T (80) and V (100) - Care and use.
- AS 3776 Lifting components for Grade T (80) and V (100) chain slings.
- AS 4497 Round synthetic fibre slings.
- AS 4797 Stainless steel chains for lifting purposes.
- AS 4991 Lifting devices.