# Guidance Note – QGN 17
# Development of effective Job Safety Analysis

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| | | |
|---|---|---|
| **North Region**<br>PO Box 5318MC<br>Townsville Qld 4810<br>Ph (07) 4760 7404<br>Fax (07) 4760 7400 | **North Region**<br>PO Box 334<br>Mount Isa Qld 4825<br>Ph (07) 4747 2158<br>Fax (07) 4743 7165 | **North Region**<br>PO Box 210<br>Atherton Qld 4883<br>Ph (07) 4095 7023<br>Fax (07) 4091 2844 |
| **Southern Region**<br>PO Box 1475<br>Coorparoo Qld 4151<br>Ph (07) 3238 3722<br>Fax (07) 3405 5346 | **Central Region**<br>PO Box 548<br>Rockhampton Qld 4700<br>Ph (07) 4938 4187<br>Fax (07) 4938 4331 | **Central Region**<br>PO Box 1801<br>Mackay Qld 4740<br>Ph (07) 4953 0860<br>Fax (07) 4953 2761 |

# Contents

# 1. Introduction

A job safety analysis (JSA) is one of several hazard identification and risk assessment tools used by the mining industry. It is a basic tool and its application and quality varies greatly. Used in the correct context, it can be a useful safety tool, however if it is used incorrectly or inappropriately, it can result in poor identification of hazards and may contribute to serious incidents across the industry.

A poorly completed JSA could increase the level of risk because people believe that they have gone through the exercise of doing a risk assessment and therefore believe they have identified suitable risk controls. This can create a false sense of risk control and security.

An industry workshop focusing on JSA was held in 2009. Conducted by Noetic Solutions, the workshop aimed to develop a consensus of defining an effective JSA. One outcome of the workshop was:

> 'It would appear that the original role envisioned for JSA has changed over time. In particular, where a JSA was originally seen to be an 'exception' and to fill a specialist, niche role – it has now expanded to be used instead of a formal risk assessment at one end of the continuum of safety tools and at the other to overlap the place of pre-start work safety preparation'.[1]

The workshop emphasised that the appropriate and effective development of a JSA in an organisation is a critical measure to ensure the risk of harm to persons performing any job is at an acceptable level.

It has become apparent that there is a need to further clarify the definition of a JSA across industry, and to develop a uniform approach to its application.

This Guidance Note was developed considering the outcomes of the industry workshop.

# 2. Purpose and Scope

The purpose of this Guidance Note is to understand what a JSA is and to advise when to use it, how to develop it and where it fits into the risk management process. It seeks to provide practical guidance for holders, operators, site senior executives, supervisors, contractors and persons generally who have obligations under the legislation.

The Guidance Note does not prevent other ways of achieving an acceptable level of risk from being adopted and followed.

# 3. Legislation

The key sections of the *Mining and Quarrying Safety and Health Act 1999* and *Mining and Quarrying Safety and Health Regulation 2001* that relate to JSAs have been reproduced in APPENDIX A: Legislation.

# 4. Definition of a job safety analysis (JSA)

Presently there are many different versions of JSAs operating in industry, including:

- Job Safety and Environment Analysis (JSEA)
- Task Hazard Analysis (THA)
- Safe Job Analysis (SJA)

[1] Outcomes of the Job Safety Assessment Workshop – Report for MMG Limited, October 2009

- Task Safety Analysis
- Pre-Work Safety Check
- Job Task Analysis

The term ‘job’ and ‘task’ are commonly used interchangeably to mean a specific work assignment. There may be many individual tasks in a job and as such ‘job’ may be a more appropriate term. Similarly ‘safety’ and ‘hazard’ can also be used interchangeably.
As the term ‘job safety analysis’ is not restricted to only identification of hazards, but the implementation of controls and verification of the effectiveness of those controls, the term ‘safety’ will have a more appropriate meaning in the context of assessment of risk in a job.

In 2002, the conference of Chief Inspectors of Mines (CCIM) published the *Minerals Industry Safety Handbook.* The handbook states:

> “Job safety analysis is an important part of a safety program for stopping work accidents and illnesses. It is about looking at each job to identify and assess hazards and set up safe work practices.

The definition of ‘job safety analysis’, according to the *National Minerals Industry Safety and Health Assessment Guideline* (Prof. Jim Joy and Dr Derek Griffiths) is:

> “A JSA is a task oriented risk assessment which can be applied by a work team prior to undertaking a potentially hazardous activity. Generally the technique is applied on site for routine activities as a precursor to a safe working procedure. It uses job observation and experience as the basis for identifying hazards and controls to be used. It is a primitive, but helpful, qualitative analysis”.

# 5. Position of JSA in the risk management hierarchy

The correct selection and application of a particular risk assessment tool depends on the complexity of the issue being assessed and the design and expected risk management deliverables of an organisation.

A JSA is one of several risk assessment tools that help to identify job or task hazards and unwanted events with the aim of ensuring the resultant risk in a job is as low as reasonably achievable (ALARA). This is done through the selection and implementation of appropriate controls.

Risk assessment tools that are commonly used in the industry include:

- Quantitative Risk Assessment (various methods) (QRA)
- Bow Tie Analysis (BTA)
- Fault / Logic Tree Analysis (FTA/LTA)
- Event Tree Analysis (ETA)
- Energy Barrier Analysis (EBA)
- Consequence Analysis (CA)
- Preliminary Hazard Analysis (PHA)
- Hazard Analysis (HAZAN)
- Hazard and Operability Assessment (HAZOP)
- Failure Modes, Effects (and Criticality) Analysis (FMEA/FMECA)
- Human Error Analysis (HEA)
- Layers of Protection analysis (LOPA)
- Workplace Risk Assessment and Control (WRAC)
- **Job Safety Analysis (JSA)**
- Stop, Think, Identify, Plan, and Proceed (Take 5)

Figure 1 (page 5) illustrates the levels or layers of possible application of risk assessment tools. It should be noted that within each layer, the application of risk assessment methods

varies depending on a number of issues. These include the complexity of the issue, the nature of the assessment, the detail and outputs required and other factors. Within each layer, several methods and tools may be used.

A JSA is a basic and low level risk assessment tool and sits above the individual, informal risk assessment tools. It is used for routine and non-routine job and task planning to help develop effective safe work expectations — such as guidelines, procedures, standard work instructions (SWIs) and job plans — and review tasks and the level of risk where adequate procedures or SWIs are not available.

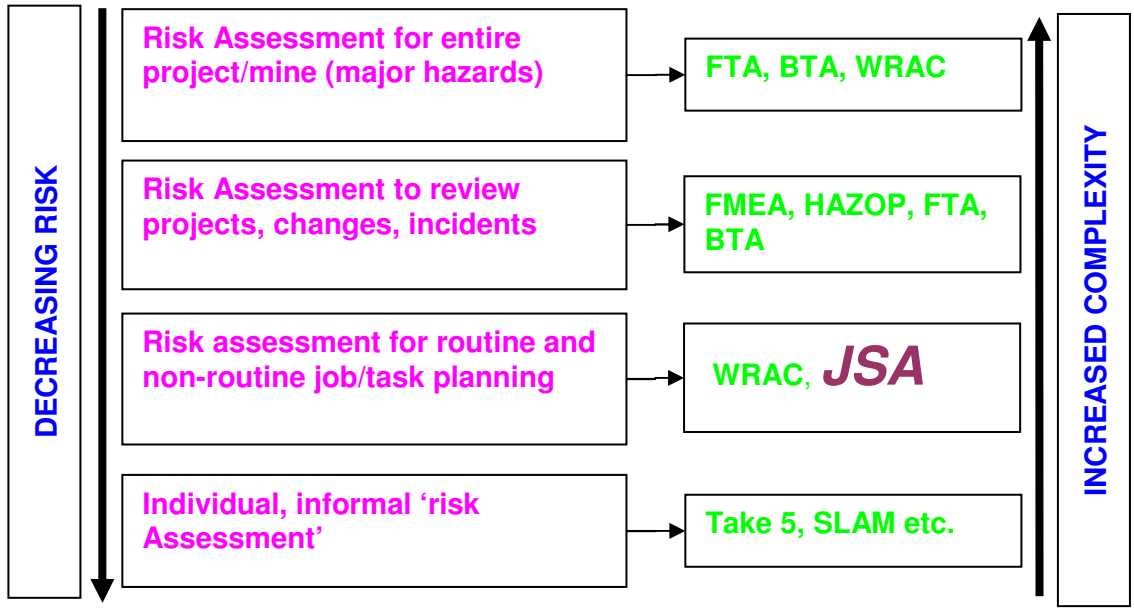


**FIGURE 1** - Levels or layers of possible application of risk assessment tools

# 6. Application of a JSA

Figure 2 (page 6) illustrates a suggested JSA flow chart. During the assignment of a job that has inadequate or no procedures or SWIs the work team, with or without the participation of the supervisor, should complete a JSA. At completion of the JSA, the supervisor is required to review and sign off the JSA where appropriate.

If a job is considered to be 'high risk' by the supervisor or the team (during personal prestart checks), a formal risk assessment as appropriate other than a JSA should be conducted by an appropriate team.

Appropriate training, competency and understanding of the task is required for the supervisor to determine the level of risk a job attracts and to recommend carrying out an appropriate risk assessment other than a JSA.

In general, a JSA should only be applied to a job when:

- the hazards and potential or resultant risks are known to be low
- there is no procedure or SWI
- developing, modifying or reviewing a procedure or SWI (where appropriate).

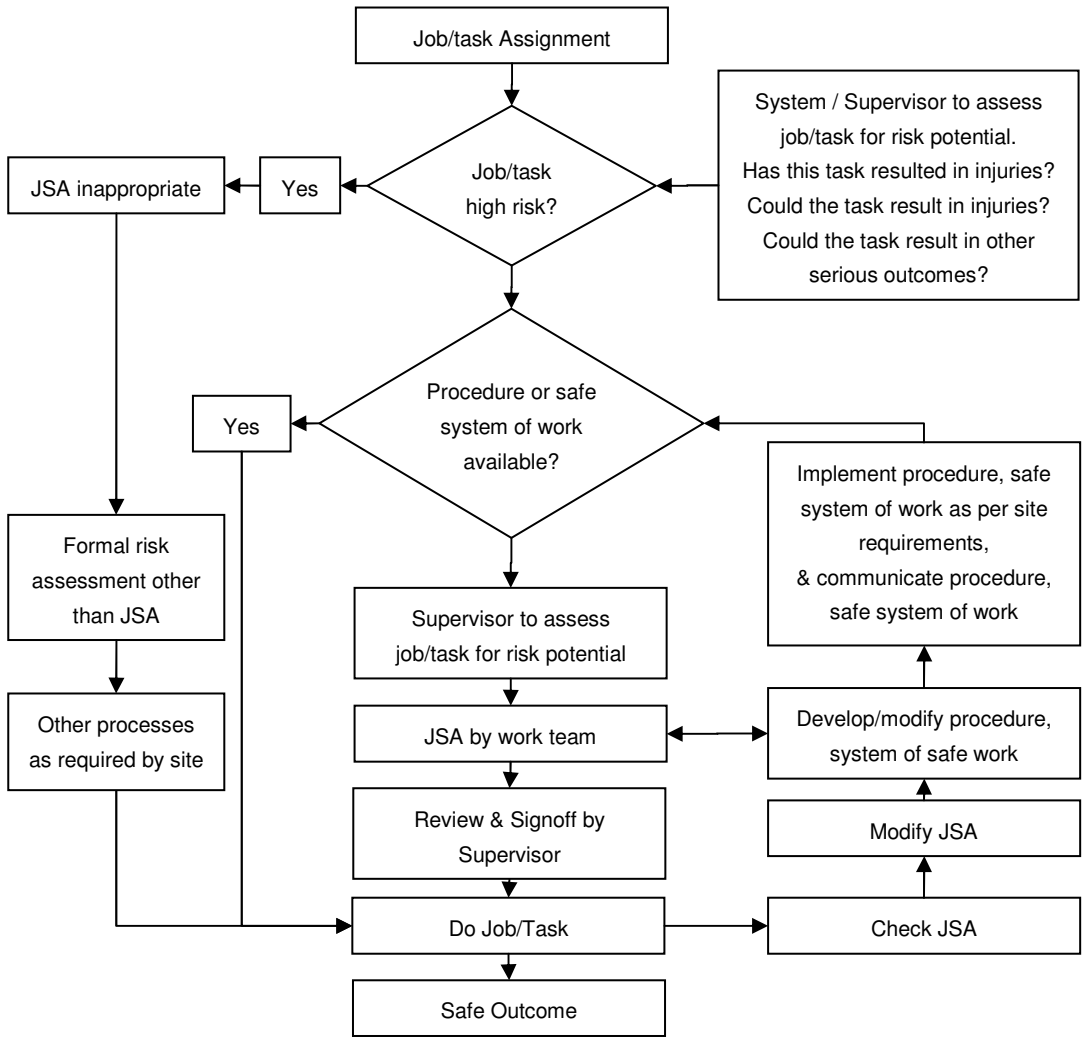


**Figure 2 – Suggested JSA flowchart**

A JSA should not be conducted as the primary tool to identify hazards and controls where the job:

- has the potential for serious injuries, illness, equipment damage or environmental harm
- is new and has not been conducted before
- is of a long duration (that is over one shift)
- involves multiple work teams
- is known to have had a history of accidents or near misses
- is unusual or complex
- involves the use of new equipment, tools, or chemicals
- involves interaction with many interdependent systems (such as electrical, mechanical or hydraulic systems).

It should also not be used as the primary tool for jobs where there is a new regulatory requirement in place or where there is a change in the process of performing a job.

**It is important that persons understand that it is not the JSA form that will keep them safe on the job, but rather the process it presents and its outcomes (for example, the risk controls).**

# 7. The value of a JSA

Before developing a JSA it is essential to understand the value of a JSA. The success of a JSA is dependent on the knowledge of those performing it and their attitude and commitment to it.

It is important to note that a JSA is not a 'personal prestart check' or 'permit to work'. A JSA is also not a compliance activity — but it is a key step in workers protecting themselves. Keeping the JSA relevant is a challenge and all involved in the process of conducting a JSA need to have a clear understanding of its purpose.

The role of the supervisor is essential in creating an effective JSA. Supervisors should have the skills and knowledge to put together a JSA or be able to oversee its development. This includes assessing how well it has been completed and how effective the chosen controls are.

The *Minerals Industry Safety Handbook* states -

> When the JSA has been done, it can be used (to) tell the worker how to do the job, and is ideal for training, since it shows a worker how to do the job in the best and safest way. It also sets the standard for the job so that everyone learns to do the job in the same safe way.
>
> The JSA can help managers and supervisors learn about the jobs to be supervised, even if they have not actually done all the jobs themselves.
>
> The JSA should be used as a checklist when doing safety inspections or audits, as it tells the auditor what should be happening on any job.
>
> The JSA provides a "measure" during any incident investigation, as it sets out how the job should be done'.

**A JSA not only contributes to the health and safety of persons but it contributes to efficiency and productivity as well.**

# 8. Developing an effective JSA

## 8.1 Resources for JSA

Make appropriate resources available to the JSA team including (but not limited to):

- sufficient time to conduct the JSA
- an appropriate JSA team experienced with the task
- a clear definition of the scope of job to be analysed
- access to participants who have job-specific knowledge
- competencies required to carry out the job safely and competently
- training on conducting or participating in the JSA process
- an appropriate JSA worksheet including relevant 'hazard prompt' checklists
- previously completed JSAs
- while developing a JSA for a modified/changed work, the SWI of the original Job
- company policies
- access to observing the job being performed under normal conditions to note job steps
- relevant accident and incident reports
- hazard and risk register(s)
- Safety Alerts or Bulletins referring to industry best practices
- OEM (Original Equipment Manufacturer's) drawings, manuals and procedures

- specialist supplier information
- Material Safety Datasheets (MSDS)
- AS/NZ standards or international standards
- internal organisational standards and specifications
- relevant codes of practices
- relevant regulatory requirements (including environmental protection policies).

## 8.2 Personnel to be involved

The *Minerals Industry Safety Handbook* states -

> Workers will take more interest in a job if they are asked to help with the JSA. Workers might have good ideas on how to do the job safely and better ways to do the job safely, for example:
>
> - some part of the workplace may need to be changed (materials, lighting, work area layout, ventilation, safety gear)
> - the number of times the job is done may need to be reduced

The following people should be involved in the development of a JSA (this list is not exhaustive):

- experienced team leader/supervisor with job-specific knowledge, and competency in conducting and writing a JSA
- persons with hands-on knowledge and expertise of the in the job for which the JSA is being performed (equipment operator, fitter. etc.)
- manager, superintendent or engineer
- technical experts
- facilitator
- safety and health professional
- equipment or process providers where appropriate (e.g. OEM representative for new equipment or a new process (optional)).

**In developing a JSA, try to involve as many of the employees as possible who carry out the work task. A JSA is an effective way of encouraging employees to participate in hazard identification, risk assessment and risk control. Through the JSA process, employees can make an important contribution to the development and maintenance of workplace safety procedures and practices.**

A JSA can be completed by a team with or without the participation of the Supervisor who should review and approve the JSA. For developing a 'Procedure/SWI', a JSA should be conducted by a broader team having regard to the nature, size and complexity of the job. The approval and sign-off level would also be escalated in such cases.

## 8.3 Where to conduct a JSA

To ensure hazards and potential risks are properly captured and addressed, JSAs should be performed at the job site prior to carrying out the job. JSAs conducted for the purpose of developing or modifying a procedure/SWI may be conducted anywhere, but inspection of the job site, task or equipment is essential. In this instance, the possibility of observing the same job or similar kind of job if being performed should be considered.

## 8.4 Procedure

All JSAs developed must be specific to the job being performed. There should be no 'generic' JSA (this should otherwise be known or converted to a SWI.).

Figure 3 illustrates the basic steps of developing a JSA.

**When a JSA is being used to assess a job or task involving equipment such as machinery or plant and interconnected mechanical items (such as hydraulics, gears, pulleys, levers, motors, gearboxes etc) careful consideration must be given to potential secondary knock-on effects of actions outlined in the JSA.**

**Serious accidents have occurred where a seemingly safe act such as disconnection of a chain, in combination with a creeping hydraulic cylinder has resulted in creating a secondary hazardous condition of that chain falling onto people while carrying out the task. For technically complex situations, the task should therefore be assessed using a risk assessment tool other than a JSA.**

## 8.5 Complete a JSA identification in the form

There are two JSA sample forms provided in Appendices B and C — one without risk scoring and one with risk scoring.

To ensure clarity, each JSA should have a job number, description, location, name of members involved and a signature column.

## 8.6 Breaking down job into basic steps

A job step is defined as a segment of the operation necessary to advance the job. When breaking down the job into basic steps care must be taken not to make the steps too general as controls may be overlooked, or missing detail may lead to missing some hazards. At the same time there should not be too many steps.

If the job is complex, steps may be combined where suitable. Ensure that the steps are in the correct sequence. Any step that is out of order may miss serious potential hazards or introduce new hazards. Each step should be started with a verb (such as 'do', 'remove', 'open' or 'fix').

Each step is to be written on the JSA form in the respective column.

## 8.7 Identify the resources required to perform tasks in each step

The front page on the form allows the workers to record what resources are needed for the job. Some examples are listed below:

- isolation equipment (such as tags, locks, etc)
- work permits eg. working at height or isolation permit
- equipment, tools, materials, or parts
- competencies required to carry out the task
- personal protective equipment (PPE) required including specialised PPE (such as harnesses etc)
- other precautions identified by the MSDS (such as ventilation)
- procedures for coordinating activities
- design drawings or plans
- safe access exits and transport

- time required to carry out the task
- team – number of people to safely carry out the task
- people with specific skills
- leadership and guidance
- communication methods
- a pre-prepared JSA (if any) noting that:
  - it may not be suitable for all situations
  - it may need a risk assessment
  - it may be useful for regular tasks or scenarios
  - if a pre-prepared form is used it is important that personnel 'own' the resulting document
  - it represents a minimum expectation for the JSA.

**It may be necessary to add to or review the list of 'resources required' while compiling the JSA as not all resource requirements may be known at the outset.**

**Also, it is important to differentiate between resources required eg. 'working at height permit' and the actual controls required to 'work at height' eg. safety lanyards. The permit is not a control per se, while the lanyard can be classed as a true engineering control.**

Each resource is written against a number or letter. This number or letter reference is then written in the 'resources required' column in the relevant step.

## 8.8 Identifying the hazard/potential losses at each step

In each step of job, the hazard identification must be done as per Section 6 of the Mining and Quarrying Safety and Health Regulation 2001, having regard to:

- visible/obvious hazards
- hidden hazards—by looking beyond the obvious
- developing hazards (the hazards that can emerge as a result of work activity in each step and also due to changes in the environment. For example, a part dismantled from a machine during servicing/repair left unrestrained may cause the development of a new hazard).
- hazards that have low initial consequence but over time the consequence may change or increase. For example, spontaneous combustion or creep in a hydraulic ram.

The hazard identification process must consider:

- the actual work environment where the job is to be conducted
- potentially unsafe acts, behaviours and oversights by personnel involved in the task
- energy sources — the energy concept is useful for understanding safety and health hazards. Physical damage to people can only occur due to energy. It is important to consider using prompts such as respecting 'people', 'environment', 'equipment', 'procedures' and 'organisations'. Or prompts in the form of questions (examples of energy sources and hazard prompts are provided Appendix B and C).
- unplanned or secondary knock-on effects of actions, behaviours, or conditions at the job site
- job observation by experienced personnel on the job site (this is particularly relevant when conducting a JSA for developing or modifying a procedure/SWI)
- previous incidents and accidents and other 'lessons learnt' information relating to the task or job.

The hazard identification process must also consider:

- any changes to work environment or tasks while the job is being conducted
- the effects when job is handed onto the next shift.

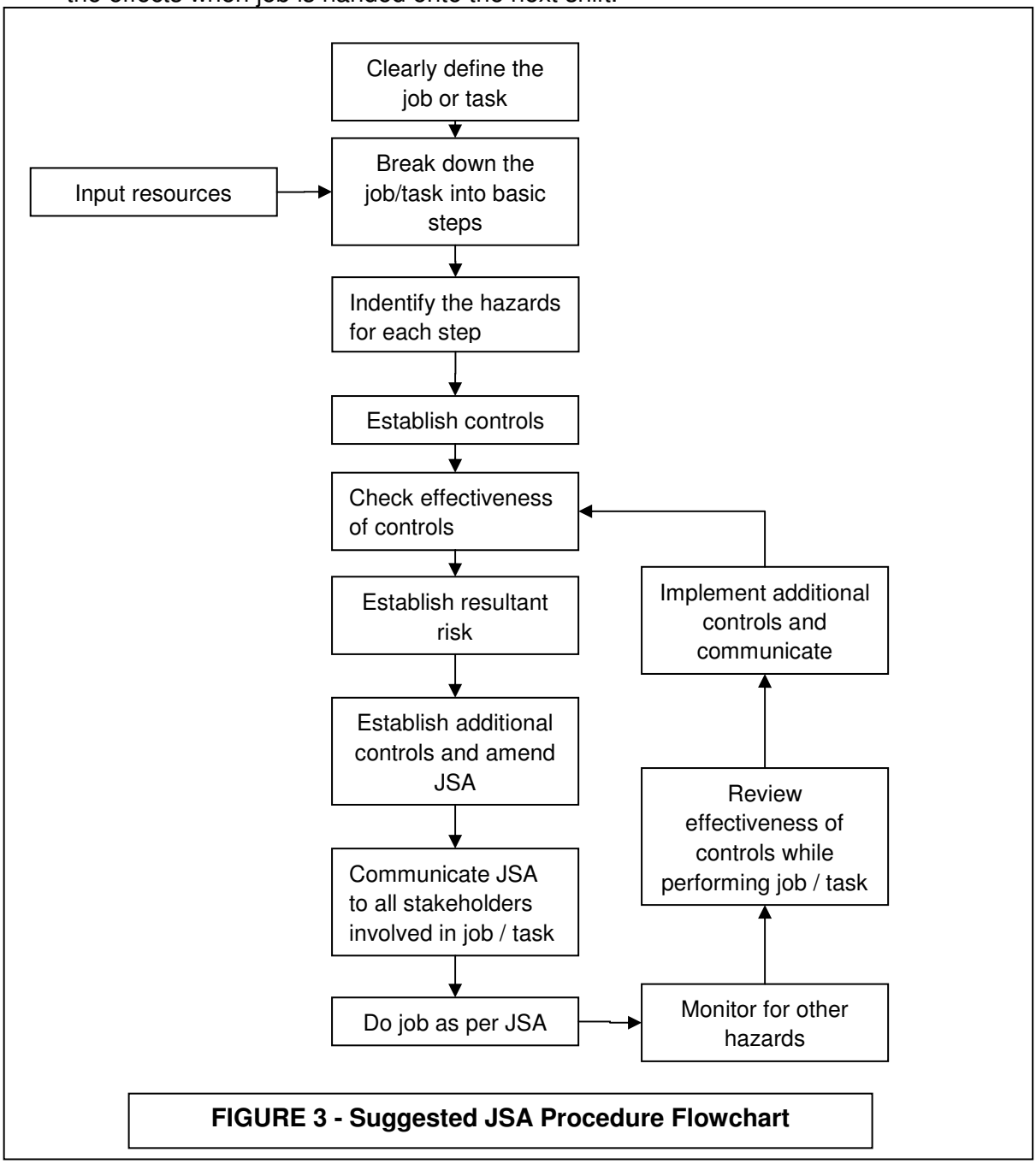


**FIGURE 3 - Suggested JSA Procedure Flowchart**

Against each task step, write the hazards in the 'hazard identified' column (Refer to Appendix B and C)

## 8.9 Establish controls

Determine the required control measures for each identified hazard as per the 'hierarchy of controls' provided in the Mining and Quarrying Safety and Health Regulation 2001. The control measures must be applied for each hazard individually or in combination and must be effective in reducing the resultant risk for each hazard to ALARA levels.

A brief outline of the 'hierarchy of controls' is given in Appendix B and C.

It should be noted that:

- all hazards and resultant risk must have at least one control measure
- the current controls in place must be reviewed to ensure that the controls are appropriate and effective
- additional controls indentified in the JSA must be available and in place while the job is being performed
- all controls must be realistic and effective in controlling the hazards and resultant risks.
- each control may have a person identified as responsible for implementing it
- **the blanket use of referring to procedures as a control in any job step is not effective and would indicate that the JSA has not been thoroughly completed. However, it is appropriate to refer to procedures as part of a control.**
- communicating the hazards and controls to the personnel performing the job is essential

**It is of little value to identify hazards and devise controls if the controls are ineffective or not implemented.**

## 8.10 Endorsing the JSA

Once the JSAs have been completed, all persons involved in the JSA must sign off in the JSA FORM. Persons should sign only after they have read and understood the JSA, and are in agreement with the content of the JSA.

## 8.11 The danger of completing an ineffective JSA

The acceptance of risk should lie with the people who will be exposed to consequences. What must be avoided is a situation where the consequences of a poor JSA are 'owned' by the employees on the job, but the decision of accept the risk is taken by management.

**Individuals should never sign the JSA without reading and understanding it. JSAs are important quasi-legal documents and are often used in incident investigations, disputes and court cases.**

**It is of no value where JSAs have been completed and persons are endorsing a JSA indicating they have read and understood it, when there were not involved in the process.**

## 8.12 Review and approval of the JSA

The review and approval process forms an important link in effective supervision. Some recommendations of review and approval process of JSAs are listed in Table 4.

| Type of JSA | Completed by | Residual risk * | Review / re-conduct JSA by | Approved by |
|---|---|---|---|---|
| JSA without risk scoring | Team and/or supervisor | - | Supervisor | Supervisor |
| JSA with risk scoring | Team and/or supervisor or appropriate escalated team | Low | Supervisor | Supervisor |
| | | Medium | Supervisor | Supervisor / Superintendent |
| | | High | Superintendent | Manager |
| | | Extreme | Manager | SSE |

**TABLE 4 - Approval levels of JSAs**

* An example of residual risk is given in the `Risk Matrix' in Appendix C. Alternatively if the job as a whole is determined to be a certain level of risk by the supervisor/planner prior to the JSA being completed then risk scoring is not required.

## 8.13 Documentation and records

A completed copy of the JSA must be available at the workplace to all personnel while the job is being performed.

After completion of the job, the completed JSA form should be stored in the mines document control system. Any procedure/SWI developed from the JSA should be awarded a unique identification number or similar (refer to Sections 116 and 117 of the Regulation) and be recorded along with the JSA.

## 8.14 Optional — assess the risk

**Estimate the likelihood/probability and consequences for each of the identified hazards to be realised at each step.**

According to the *National Minerals Industry Safety and Health Assessment Guideline* (Prof Jim Joy and Dr Derek Griffiths):

> In JSAs it is not wise to rank the hazards. This is because all identified hazards should be addressed with a counter-measure. The management level at which this analysis is carried out, should not provide an option to 'accept the risks associated with any identified hazard

It is therefore recommended that risk scoring should be done only for JSAs that are used as part of developing a procedure/SWI. In such cases, the JSA should be performed only by a team suitable for the nature, size and complexity of the job. The approval and endorsement level would also be escalated in such cases.

The procedure may be as follows:

- establish the consequence or severity for each identified hazard. There may be more than one consequence for a given hazard. Each must be assessed individually)
- establish the likelihood/probability of the consequence occurring for each identified hazard
- use a 'risk matrix' to assign a score for each identified hazard. An organisation may develop its own or use the already developed criteria for evaluating consequence and likelihood and may determine the risk score using the site's risk matrix)

An example of criterion for determining consequence and likelihood and a 'risk matrix' has been given in the JSA Form at Appendix C.

## 8.15 Optional — assess the residual risk after control measures have been implemented

**(This step shall be done only if risk scoring is included.)**

Using the risk matrix, determine the risk scoring for the residual/retained risk.

Record the likelihood and consequences score from the matrix and evaluate the hazard.

# 9 Training

A person must be able to demonstrate the skill and knowledge required to carry out JSA to a standard that will ensure the risk in a job is at an acceptable level.

To satisfy the requirements of JSA competency, the individual must:

- undergo initial training on JSAs (through formal training courses and informal on-the-job instruction) to understand the value, importance, context, application and the basic process of conducting JSAs. The training module must include the hazard identification process.
- undergo regular refresher training on JSAs.
- receive specialised training on JSAs for team leaders of the work groups.

Appropriate training modules should be developed in line with recognised standards and the training should be undertaken by appropriate trainers with relevant industry experience. The competency of the worker must be assessed and all the training and assessment records are to be kept. The training should cover both theoretical and practical skills and knowledge.

In addition to the above requirements, all supervisors must undergo specialised training on conducting JSAs as one of the core competency requirements as per mining industry advisory councils. The training module must include the criteria of the factors for determining the level of risk in a job requiring a JSA to be completed.

# 10 Audit and review

A Job Safety Analysis can be effective if it is reviewed and updated periodically.

Because a JSA produces permanent instructions, it should be a continuing activity. JSAs have to be kept up to date or the benefits will be lost over time. Misinformation or an out-of-date JSA can be dangerous.

All JSAs are to be reviewed during the execution of the job. Any changes and updates (such as different or new controls) required are to be recorded on the JSA form and documented. These changes must be communicated to those people working on the job to ensure their safety.

Ideally, the JSA should be reviewed by the work team at the end of the job to ensure it achieved a safe job outcome. Even if no changes have been made in a job, hazards that were missed in an earlier analysis could be identified at the time of review.

The JSA for a particular task should be repeated if:

- the job cannot be carried out as outlined in the JSA
- an accident occurs on a job covered by a JSA
- a job method is changed
- a job process is changed
- the work environment has changed
- a safety inspection shows that the job is not being performed according to the JSA.

An appropriate team should conduct formal reviews of the JSA/SWI at certain intervals to evaluate the effectiveness of the JSA process.

After the recommendations are approved by competent persons, the procedure must be modified and implemented. Once implemented, the process should continue to be regularly monitored and audited.

Any changes and updates to the JSA must be communicated to all personnel involved in the job before the job is commenced. If a JSA or a SWI has been modified, the associated training components should also be modified accordingly to ensure people are aware of changes made.

# 11 Pitfalls

There are three main problems in conducting JSAs that could prevent them being useful including:

- not listing all the hazards
- listing the hazards, but taking no action
- making unclear instructions'. [2]

Also using JSAs to identify and manage hazard and risk issues that are outside the capability of the JSA tool must be avoided.

# 12 JSA do's and don'ts—a brief revision

- A JSA is a basic and low level hazard identification and risk assessment tool.
- Don't use JSAs as the default primary tool to identify hazards and controls when the job has the potential for serious injuries, illness, equipment damage or environmental harm, is complex, new or unusual, has history of accidents, involves the use of new equipment, tools, or chemicals, when there is a change in the process or when the job involves interaction with many interdependent systems (for example electrical, mechanical, hydraulic).
- A JSA should only be applied to a job when the hazards and resultant risks are known to be low, there is no procedure or SWI or when developing, modifying, reviewing a procedure or SWI.
- As a minimum, a good JSA requires input from and experienced team comprising a supervisor with job specific knowledge and persons with hands-on knowledge and expertise in the job.
- All JSAs require signoff by a job experienced and JSA trained supervisor.
- To ensure hazards and resultant risks are properly captured and addressed, JSAs should be performed or reviewed at the work/job site prior to carrying out the job.
- Ensure the JSA team has the necessary resources available to compile the JSA - skill, sufficient time, JSA form/worksheet including appropriate hazard prompt checklists etc.
- Doing a JSA involves breaking the job down into its job steps, establishing the job hazards in each step, and agreeing on effective controls.
- Be aware when doing a JSA on technically complex systems. Also consider effects of the environment, unforeseen changes and handover issues to the next shift.
- Before the job can commence, effective controls must be in place.
- Communicating the hazards and controls to the personnel undertaking the task is essential before the team doing the job can agree to sign off on the JSA and commence the job.
- All JSAs are to be reviewed by the team during the execution of the job. Any changes and updates e.g. different or new controls required are to be recorded, and communicated before the job can recommence.
- When undertaking a JSA do not only consider the basic issues such as slips and trips but also the primary hazards that exist in the job such as the potentially damaging sources or energy (gravitational, kinetic, thermal, mechanical, chemical and electrical) and those that may be created or released as the job progresses.

# 13 Conclusions

Although the focus of this Guidance Note is on developing an effective JSA it is important to note that all levels of risk management are equally important in overall safety and health management.

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[2] Mineral Industry Safety Handbook

JSA is an important part of any organisation's Health and Safety Management System for the prevention of work related accidents, injuries and illnesses.

The JSA technique is good way of getting employees to take part in assessing safety and reducing accidents. Through JSA, workers can play an important part in setting up and maintaining safe work procedures. It is also a part of "consultation" which may be in legislation (Mineral Industry Safety Handbook).

Everybody in the workforce should be involved in creating the JSA. The more minds, the more years of experience applied to analysing the hazards in a job, the more successful the work group will be in deciding on suitable and effective hazard and risk controls.

# 14 Acknowledgements

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|---|---|
| Minerals and Metals group | Century Mine |
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| NQM Gold Pty Ltd | Pajingo Mine |
| Incitec Pivot Limited | Phosphate Hill |
| Hanson International / Hanson PLC | Roseneath Quarry |
| CEMEX Australia Pty Ltd | Bohle Quarry |
| BHP Billiton Minerals Pty Ltd | Cannington Mine |
| Resolute Mining Ltd | Carpentaria Gold |
| Resolute Mining Ltd | Ravenswood |
| Kagara Limited | Balcooma/Dry River South |
| Ernest Henry Mining Pty Ltd | Ernest Henry - Mine |
| Kagara Zinc Limited | Mt Garnet Operations |
| Mungana Pty Ltd | Mungana Exploration Decline |
| Charters Towers Gold Mines Ltd | Warrior Mine |
| Rio Tinto Aluminium Ltd | Weipa Mine |
| Ivanhoe Cloncurry Mines Pty Ltd | Ivanhoe Cloncurry Mines |
| Lorena | Lorena |
| Newcrest Operations Limited | Cracow Mine |

Acknowledgement is also due to Noetic Solutions Pty Limited for facilitating the workshop.

# 15 References and further reading

1. Queensland Government, *Mining and Quarrying Safety and Health Act 1999*
2. Queensland Government, *Mining and Quarrying Safety and Health Regulation 2001*
3. Chief Inspector of Mines (2002), Mineral Industry Safety Handbook
4. AS/NZS 31000:2009 Risk Management – Principles and guidelines
5. J. Joy and D. Griffiths (2004) "National mineral industry safety and health risk assessment guideline"
6. Mineral industry safety and health risk management guideline MDG 1010
7. SRMP A4 course materials

(b) hazardous substances or dangerous goods that are a product, by-product or waste product of operations;
(c) hazardous substances or dangerous goods occurring in—
(i) the natural environment; or
(ii) plant or facilities; or
(iii) energy sources.

**Section 7 Risk analysis**

(1) A person who has an obligation under the Act to manage risk at a mine must analyse risk in the person's own work and activities to decide whether the risk is at an acceptable level.
(2) The person must have regard to the following in analysing the risk—
(a) the results of hazard identification, risk monitoring and incident investigations carried out for the mine;
(b) the work environment and work methods for the mine's operations;
(c) the interaction of hazards present at the mine;
(d) the effectiveness and reliability of hazard controls in use at the mine;
(e) other reasonably available relevant information and data from, and practices in, other industries and mining operations.

**Section 8 Risk reduction**

(1) A person who has an obligation under the Act to manage risk at a mine must, as far as reasonably practicable, apply hazard controls in the following order—
(a) elimination of the hazard;
(b) substitution with a lesser hazard;
(c) separation of persons from the hazard;
(d) engineering controls;
*Examples of engineering controls—*
1 using fans and ducting to remove dust
2 using guards on conveyors

(e) administrative controls;
*Examples of administrative controls—*
1 a restriction on the time a worker is exposed to a hazard
2 a procedure or standard work instruction
(f) personal protective equipment.
(2) The site senior executive must ensure hazard controls used to reduce risk in the mine's work and local environments are appropriate having regard to the following—
(a) the interaction of hazards present in the environments;
(b) the effectiveness and reliability of the controls;
(c) other reasonably available relevant information and data from, and practices in, other industries and mining operations.

**Section 9 Risk monitoring**

(1) A person who has an obligation under the Act to manage risk at a mine must monitor risk in the person's own work and activities at the mine.
(2) The site senior executive must ensure risk in the mine's work and local environments caused by the mine's operations is monitored—
(a) when the operations start; and
(b) at appropriate intervals or stages during operations at the mine; and
(c) when the mine's risk management practices or procedures change significantly.

(3) Monitoring must include—
- (a) the occurrence of incidents, injuries and ill health; and
- (b) the level of hazards present in the mine's work environment; and
- (c) for monitoring under subsection (2)—the level of hazards from the mine's operations present in the mine's local environment.

(4) If it is appropriate, having regard to the nature and level of a hazard present in the work environment, the monitoring must include 1 or more of the following—
- (a) personal monitoring to decide a worker's level of exposure to the hazard;

  *Example of personal monitoring—*

  monitoring a worker using a dosimeter or other instrument to measure the worker's level of exposure to noise
- (b) self-monitoring to detect effects of the hazard;

  *Example of self-monitoring—*

  self-recognition of physical symptoms of heat stress or fatigue
- (c) biological monitoring to decide a worker's level of exposure to the hazard;

  *Example of biological monitoring—*

  testing a blood sample for lead
- (d) health surveillance under section 138.

**Section 93 Training**

(1) The site senior executive must ensure each worker at the mine is trained, if necessary, and periodically assessed, to ensure the worker has adequate—
- (a) knowledge and understanding of the processes to be carried out, and the materials and plant to be used, for the worker's duties at the mine; and
- (b) skill to carry out the processes, handle the materials and operate the plant; and
- (c) ability to access and understand the procedures and standard work instructions for the worker's duties.

(2) The training must be carried out in an appropriate way, including, for example, by formal training courses or informal on-the-job instruction.

(3) The assessment must be carried out in an appropriate way, including, for example, by examination, test or proof of relevant prior learning.

(4) The site senior executive must ensure a person being trained or assessed does not carry out work at the mine unless the person is adequately supervised to prevent creating an unacceptable level of risk.

(5) Subsection (4) does not apply to work carried out by the person in an emergency.

**Section 95 Time and resources for carrying out tasks**

(1) The site senior executive must ensure time is allocated, and the mine's resources are distributed, to enable each worker at the mine to carry out the worker's tasks without creating an unacceptable level of risk.

(2) Without limiting subsection (1), the site senior executive must ensure the worker is given the supervision and assistance from other competent persons, necessary to achieve an acceptable level of risk.

*Example of assistance—*

If the worker is working alone in a bin, or on a busy roadway, the worker may be given assistance by another worker keeping a watch to ensure the level of risk is acceptable.

(3) In this section—

***resources*** includes the following—
- (a) access and transport;
- (b) communication methods;
- (c) facilities, materials and plant;

*Examples for paragraph (c)—*

consumable items, spare parts and personal protective equipment

(d) leadership, guidance and training;

(e) procedures, including procedures for coordinating activities, and standard work instructions and other relevant information.

**Section 96 Supervising workers**

(1) Without limiting section 95(2), the site senior executive must ensure the mine's activities and workers are supervised to the extent necessary to ensure each worker—

(a) is not likely to be exposed to conditions beyond the worker's capabilities; and

(b) is not likely to be affected by the conditions in which the worker is working in a way that adversely affects the worker's fitness to perform critical tasks; and

(c) has the resources necessary to carry out the worker's tasks without being exposed to an unacceptable level of risk; and

(d) is working within the limits of the worker's fitness and competence; and

(e) complies with the worker's safety and health obligations.

(2) The supervision must include communication, including direct contact, at appropriate intervals by the worker's supervisor.

**Section 114 Procedures and standard work instructions for particular Operations**

(1) This section applies to operations at a mine if, having regard to the nature and level of risk from the operations, it is necessary for managing the risk for the operations to be—

(a) uniform and consistent in their performance or results; or

(b) compatible with other operations at the mine.

(2) The site senior executive must ensure the mine has a written procedure or standard work instruction for carrying out the operations.

**Section 115 Accessing current procedures and standard work instructions**

The site senior executive must ensure—

(a) the issue and availability of the mine's written procedures and standard work instructions are controlled to ensure only current versions are in use; and

(b) each worker at the mine is aware of the current written procedures and standard work instructions for the part of the mine's operations in which the worker works; and

(c) copies of the current procedures and instructions are available to each worker to whom they apply.

**Section 116 Written procedures**

The site senior executive must ensure each written procedure for an activity carried out at the mine includes the following—

(a) the procedure's purpose;

(b) the activity to which it applies;

(c) the responsibilities of persons involved in the activity;

(d) a description of how the activity must be carried out;

(e) a reference to relevant standard work instructions and other relevant written procedures;

(f) an appropriate identification, including the procedure's version number and date of issue.

**Section 117 Standard work instructions**

(1) The site senior executive must ensure each standard work instruction for a task at the mine is—

(a) in a form suitable for use at the site where the task is carried out; and

(b) easily understandable by persons carrying out the task; and

(c) as brief and concise as is reasonable.

(2) The site senior executive must ensure the standard work instruction includes the following—

(a) the purpose of the task;

(b) a description of how the task must be carried out;

(c) a reference to relevant written procedures and other relevant standard work instructions;

(d) an appropriate identification, including the instruction's version number and date of issue.

* * *

# 17 APPENDIX B: JSA Sample Form 1

| COMPANY NAME/LOGO | JOB SAFETY ANALYSIS – JSA 1 | | DATE: |
|---|---|---|---|
| DEPARTMENT | SITE/AREA | JOB TITLE | JSA No.<br>No. of times this JSA has been used: 1 2 3 |
| EQUIPMENT NAME/No. (IF ANY) | Is any isolation required before commencing the job? Yes/No<br>(If yes, consult supervisor and obtain signature) | | Supervisor Signature |

| JSA TEAM MEMBER'S NAME | SIGNATURE | JSA TEAM MEMBER'S NAME | SIGNATURE |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **List of tools/equipment/materials/drawings etc. for the job** | **List of PPE required for the job** | **List of persons involved in the job (other than JSA members)** | **Signature** |
| | | | |
| | | | |
| | | | |
| **Supervisors Authorisation** | **Signature** | **Print Name** | **Date:** |

| SEQUENCE OF BASIC JOB STEPS | RESOURCE REQUIRED | | POTENTIAL HAZARDS | CONTROL | RESPONSIBILITY |
|---|---|---|---|---|---|
| | Personnel | Tools/ equipment | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## IDENTIFY HAZARD:

| Consider energy source for hazard identification | |
|---|---|
| ***Energy*** | Suggested description |
| **Gravity** | Falls of things, falls of people, uncontrolled movement (minerals hazards such as fall of ground, falling off structure, vehicle runaways, etc). |
| **Chemical** | Solids, liquids, gases that burn, explode, affect people due to contact, inhalation or ingestion (minerals hazards such as spontaneous combustion in coal, sulphide dust explosion, methane explosion, acid spills, fuel/oil fires, etc.) |
| **Electrical** | Contact, induction, arcing (minerals hazards such as inadvertent contact, faults, arcing in a gaseous environment) |
| **Mechanical** | Caught in, hit by, collisions (minerals hazards such as vehicle collisions, caught in moving equipment, hit by moving machinery, machine vibration, etc.) |
| **Pressure** | Release or explosion of air/gas, water/liquids, hydraulics or mechanical items under pressure (including noise) (minerals hazards such as pneumatic/tyre failures, hydraulic pressure releases, spring pressure release, excessive noise, etc.) |
| **Radiant** | Radiation, hot or cold surfaces (minerals hazards such as radioactive materials, sunshine, overheated mechanical equipment, refrigeration systems, etc.) |
| **Magnetic** | Items that are magnetised (minerals hazards such as magnetism used in aluminium processing, etc.) |
| **Bio-mechanical** | Overexertion, repetition, slip / trip hazards causing injury or illness to a person. The body's mechanical energy that slips, trips, strains, sprains (minerals hazards such as manual handling, poor housekeeping, poor access, poor work positions, etc.) |
| **(Micro)biological** | Biohazards, microbiological , viruses, bacteria, wildlife - dangerous animals - animal bites, toxic vegetation |

| Consider prompts with respect to the people, environment, equipment, procedures and organisation | |
|---|---|
| **Prompt** | **Suggested Description** |
| People | Ability, Alertness, Physiology, Psychology, Roster, Training, unsafe acts, interaction between people etc. |
| Environment | Illumination, precipitation, contaminants, noise, temperature/humidity, wind/turbulence, vibration, acceleration/ deceleration, radiation, work surface/space, electricity, air pressure, wildlife, unsafe conditions, interaction people/working environment etc. |
| Equipment | Design, construction, operation, man machine interface, PPE, emergency response equipment etc. |
| Procedures | Correctness, safety, availability of necessary information, task specific, emergency provisions, effective hazard/risk control, etc. |
| Organisation | Culture, facilities, communication, supervision, training, structure etc. |

| Consider Hazard prompts | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Body position | Tools/ equipment | Falling objects | Hydraulic | Entanglement | Height | Fire | Dust | Digging/ excavation | Poor housekeeping |
| Lifting | Rotating machinery | Uncontrolled movement | Air | Weight | Depth | Engulfment | Electrical | Storm | |
| Pushing/ pulling | Moving machinery | Suspended load | Oil | Chemicals | Slips/trips | Noise | Spark | Fog | |
| Fatigue | Moving Vehicles | Projectile | Stored energy | Acid | Confined space | Vibration | Uneven ground | Rain | |
| Dehydration | Unplanned movement | | Pinch points | Gas | Heat | Radiation | Roof and rib failure | Wild life | |
| Mechanical | Unrestrained objects | Pressure release | Sharp edges | Grease | Hot objects | Lighting | High/low wall failure | Pedestrians | |

| Questions (sample only) | Yes | No |
|---|---|---|
| What training does a person need to have to carry out the task safely and competently? (incl training in the use of PPE and other safety type equipment) | | |
| What are the 'knock-on' effects of particular task step? (particularly important when dealing with mechanical equipment) | | |
| Can any body part get caught in or between objects? | | |
| Are the correct tools and equipment available to carry out the task safely? | | |
| Have all controls suggested by the relevant MSDS been obtained and are they available at the jobsite? Have people been trained in the use of such equipment? | | |
| Do tools, machines, or equipment present any hazards? | | |
| Can anybody make harmful contact with moving objects? | | |
| Can an energised or pressurised system hurt anyone? | | |
| Can anyone receive electric shock? | | |
| Can anybody slip, trip, or fall (incl fall from height? | | |
| Can anybody suffer strain from lifting, pushing, or pulling? | | |
| Is anybody exposed to extreme heat or cold? | | |
| Is excessive noise or vibration a problem? | | |
| Is there a danger from falling objects? | | |
| Is lighting a problem? | | |

| Questions (sample only) | Yes | No |
|---|---|---|
| Can weather conditions affect safety? | | |
| Is harmful radiation a possibility? | | |
| Can contact be made with hot, toxic, or caustic substances? | | |
| Are there dusts, fumes, mists, or vapours in the air? | | |
| Are there any other hazards around the workplace that ought to be considered, eg traffic movements? | | |

**ESTABLISH AND IMPLEMENT CONTROL*:* Determine the control measures for each identified hazard as per the hierarchy of controls.**

| | | |
|---|---|---|
| 1 | Elimination– remove hazard completely | Most effective |
| 2 | Substitute – substitute with lesser hazard | |
| 3 | Separation – separation of persons from the hazard | |
| 4 | Engineering control – guarding etc. | |
| 5 | Administrative control – signage, training etc. | |
| 6 | Personal protective equipment (PPE) – earplugs, safety glasses etc. | Least effective |

| DETERMINE RISK | | | | | | |
|---|---|---|---|---|---|---|
| **Probability Factor** | | **Consequence severity** | | | | |
| | | **Low** | **Minor** | **Moderate** | **Major** | **Critical** |
| **A** | Happens often | **High** | **High** | **Extreme** | **Extreme** | **Extreme** |
| **B** | Could easily happen | **Moderate** | **High** | **High** | **Extreme** | **Extreme** |
| **C** | Could happen and has occurred here or elsewhere | **Low** | **Moderate** | **High** | **Extreme** | **Extreme** |
| **D** | Hasn't happened yet but could | **Low** | **Low** | **Moderate** | **High** | **Extreme** |
| **E** | Conceivable but only in extreme circumstances | **Low** | **Low** | **Moderate** | **High** | **High** |

| **ESTABLISH AND IMPLEMENT CONTROL*:* Determine the control measures for each identified hazard as per the hierarchy of controls.** | | |
|---|---|---|
| 1 | Elimination– remove hazard completely | Most effective |
| 2 | Substitute – substitute with lesser hazard | |
| 3 | Separation – separation of persons from the hazard | |
| 4 | Engineering control – guarding etc. | |
| 5 | Administrative control – signage, training etc. | |
| 6 | Personal protective equipment (PPE) – earplugs, safety glasses etc. | Least effective |