

## **Development of Risk Management Process**

### **An example presentation, prepared for further discussion and review**

#### **Introduction**

An extractive industries company (mining and quarrying) may be considering enhancing the Risk Management processes within their Health and Safety procedures.

This example proposal outlines how this could be achieved and proposes a 4 phase introduction.



**Mike Cameron**  
Principal

March 2009

**Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

## Example Risk Management (RM)

Risk Management Policy	Risk Management System/Process	Train the Trainer	On-going Workshops	Audit and Review
<b>Policy</b>	<b>System</b>	<b>Training</b>	<b>Risk Management</b>	<b>Audits</b>
Include a RM section within the company's corporate OH&S Policy and each operational policy document at the mine / quarry.	Overview of RM system to demonstrate management support, set realistic time-frame, confirm methodology agree responsibilities and reporting mechanism.	Run training workshops, incorporating RM, to demonstrate techniques and to establish champions (from within mine / quarry management OH&S committee supervisors and others)	Run workshops with accredited company champions, on a regular basis, with reporting to OH&S committee. Focus on wedges from workplace. Follow-up to be activated by OH&S committee with accountability for action / outcome by mine / quarry management.	Run audits using both in-house and external champions. Designed to ensure compliance with an agreed and appropriate level of RM standards whilst keeping the process active and of value.
	<b>Process</b>	<b>Workshops</b>	<b>Management</b>	<b>Report</b>
	Establish context Identify risk Analyse risk Assess risk  Set priorities Treat risk Report actions	Identify worksite issues / examples through mine / quarry-wide sessions.	Enthusiastically sponsor and support activities that encourage the use of RM philosophy and continuous improvement	Regularly report progress and identify success / failure of any activity – noting corrective actions, whenever appropriate.
		<b>Training</b>	<b>OH&amp;S Committee</b>	
		Implement additional, competency based training - to a National Standard for Indian mines / quarries.	Focus attention. Mentor teams and monitor actions. impact on other work groups and thoroughly investigate all unusual incidents and accidents.	

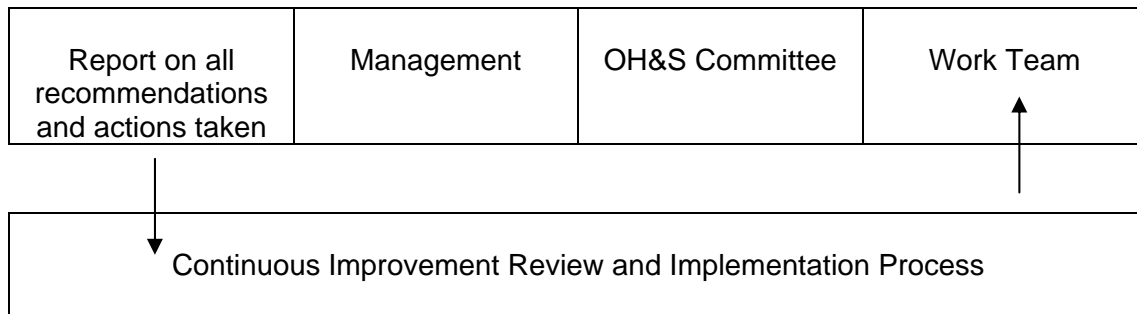
↓

High cost options to be considered by management	OH&S Committee.	Easy to implement actions to be decided upon and actioned by work team.
--	-----------------	---

**Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781



## Discussion

The management of risk has become an integral component of everyday mining / quarrying operations. In all facets of the mine / quarry: planning, design, equipment selection and production, the health and safety of personnel can be improved by 3 simple steps: -

- Identifying any hazards
- Assessing the risks
- Taking action to eliminate and / or minimize critical risks

These techniques can be applied, by everybody in the workplace, to assist the company in achieving / maintaining a safe operation during both planned and unexpected activities within the mine / quarry.

Empowering managers, supervisors and workers, through a clear understanding and acceptance of risk assessment techniques, can both improve health and safety statistics whilst leading to an increased appreciation of the workplace and those potential dangers that need to be managed. It can also become an important cornerstone in a continuous improvement process. However, there is a risk that it may also raise expectations, within the workforce, if not properly managed.

It is important that management fully supports the process. This does not necessarily mean top down control since the open encouragement to contribute of those with real 'hands-on' knowledge and / or information often produces better and more easily accepted methodology. Furthermore, involving the team should ensure active support during the implementation phase.

Management needs to balance its options for realistic and achievable controls against the meeting of all regulatory requirements and the timely and cost effective implementation of all approved actions from the RM process.

Care needs to be taken when implementing a risk management assessment process within the workplace. It is important to apply a balanced, yet critical, view of the risks in doing a certain activity. By way of a non-work example, we all know about the dangers on the highways but this stops few of us from driving. Some people ignore the risks whilst others moderate the way in which they drive. At work, we need a knowledgeable

### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

workforce where equipment, operational process / methodology, competence, behaviour and attitude match the dangers.

When creating lists of potential hazards from a large number of activities - many of which can lead to death (in extreme circumstances) - the process can reduce our capacity to rationalize and then prioritise our actions. As such, this approach can be an ineffective way of assessing risks and subsequently developing a RM process.

We prefer to discuss risk from the perspective of: -

- the likelihood of an event occurring;
- the consequence when this event does occur  
and
- the exposure of personnel

These 3 factors can be used to understand and assess the risk in a qualitative (or quantitative) manner. Separating the appreciation of the hazard from its priority setting and from an assessment of possible control methodology means that new ideas are opened up to all participants. The immediate "I know what's wrong and what to do" responses that often occur during health and safety forums are frequently based on one person's understanding and / or appreciation of both the hazard and the controlling mechanism.

A group representing operators, supervisors, managers and process / procedure designers can be a powerful force in unleashing cheap, effective and achievable solutions that they will own moving forward.

## **Development of the Risk Management Processes**

Extractive Consulting would first review a number of relevant company OH&S, industry safety and Australian risk management documents prior to putting together a proposal on how to implement Risk Management throughout one of your extractive operations.

These company documents may include: -

- The current edition of your corporate Health and Safety Manual
- The operational policy documentation from each of your extractive operations

These Australian documents may include: -

- Australian Standard on Risk Assessment AS 4360 – 1995
- Managing Health and Safety for Quarries; Minerals Petroleum Victoria, 2001
- Safety Management Plan – Workbook; Institute of Quarrying Australia, 2000
- Guidelines for Safe Mining; Mineral Resources NSW, 2000
- National Mining ITAB Risk Management Competencies and Qualifications
- Risk Management Assessment Policy – Queensland Mining Company, 2002

It is proposed that the extractive industries company carry out this development in 4 phases as follows: -

### **Phase I**

Review of the company's OH&S and other Risk Management literature  
Presentation of concept for development

### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

Open discuss of the document and agreement on the way forward  
Cost Aus\$ ~ yet to be established and/or agreed

## Phase II

Development of RM processes, workshops and training options  
Discussion with representatives from the company ~ Mine / Quarry Managers and others  
Finalisation of Risk Management process  
Preparation of presentation material.  
Workshop implementation with key personnel from the company  
Cost to be determined following discussions with both you and your company's nominee during the Phase I session above.

## Phase III

Workshops at 1 or 2 extractive operations, targeted at 2 levels within the organisation and designed to clearly demonstrate the proposed techniques whilst seeking to identify and empower champions for later Risk Management training and implementation activities: -

- Actions across the total mining / quarrying operation (involving Mine / Quarry management, Occupational Health & Safety Representatives and others)
- Actions during particular operational activities (involving a representative wedge through mine / quarry operational management, supervision and operators)

## Phase IV

Supervisors, Occupational Health & Safety representatives and / or the company's process Champions carry out risk management, on a regular basis, within an agreed and documented procedural framework.

Quality improvement reviews conducted by internal or external parties to maintain momentum, clarify issues and promote this new way of working.

Further training carried out for management, Occupational Health & Safety representatives and operators as required.

## Risk Management Processes

### 1. Establish the Context.

The strategic context The organisational context The risk management context
--

Risk Management techniques can be used during planning, design, equipment selection and / or operation of a mine / quarry.

One of the first tasks in Risk Management is to establish the scope of studies to be carried out by any group – what are its boundaries, what are its goals and objectives and

### Extractive Consulting,

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

who should be involved. This helps to establish the stakeholders for the study (eg. from contractors, process / procedure designers, engineers, managers, operators, maintenance people, suppliers, government and regulatory authorities, neighbours, unions, insurers, financiers, customers) It also helps to establish how to develop and then run the study (eg in designers office, work groups, wedge through business).

In this particular example case, Extractive Consulting ~ in close association with the company's management team ~ is proposing that risk management concentrates on the operation of an extractive operation (eg. mine or quarry). This may also include intra-mine / quarry activities (such as the purchase of goods) or simply be focused on the work steps associated with any specific production activity.

Normally risk management is best achieved by using a cross section of those involved in the activity. This does not necessarily mean large numbers of people but frequently calls upon a supervisor, together with the operators who carry out the tasks, and someone associated, but not necessarily directly involved, in the job's process. We believe that the group should neither be too narrow nor too broad with a specialist or other participants - such as a contract driller - who interact in the work process, being a desirable inclusion within the group.

The involvement of the OH&S committee is critical both in supporting the process, monitoring the proposals and actions and ensuring other groups within the mine / quarry can interface during the creation and establishment of the new procedures. In some cases the committee will actively drive the risk management assessment reviews, following accidents, unusual incidents and / or near misses. It may also be necessary for the committee to make proposals or offer recommendations to management when control solutions are beyond their capability, or that of the work group, to authorise.

Management needs to support the process by being directly involved or by facilitating the analysis and evaluation activities whilst ensuring that the extent, timing, controls and criteria for the study are appropriately and clearly defined. Management needs to ensure that all appropriate actions are taken to control and / or minimise identified hazardous situations – as and when they arise.

## 2. Identify the Hazards

What Can Happen ? How Can it Happen ? What are the potential Outcomes ?
---

Identifying hazards is best done with all the support and active participation of the stakeholders. Each will look at the issues from a different perspective and thus add value to the risk management process. Hazards should be identified as action statements that encapsulate the situation and the consequences that may result from that event.

For example it is insufficient to say: “**rocks could fall from a face**”. Rather one should say: “**rocks could fall from a face, roll across the road and hit a truck**” or “**rocks could fall from a face and undermine the upper bench**”.

The action statement provides focus on the event raising concern. Each case will have a different consequence. The likelihood of each event is also different.

### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

How does one examine the hazards across an extractive operation? Sometimes this may be best done by separating work activities into different steps. For example: "Go for a drive" with the dump-truck driver and see what is done on a regular basis: -

Steps in the work process: - load-haul-dump-maintain-refuel-parking.

But don't forget the unusual situations.

Perhaps you need to examine one particular part of the activity in great detail if there have been accidents, near misses or unusual incidents. (eg. climbing into the cabin; reversing at a specific dump / stockpiling site).

Alternatively the work site can be examined by considering typical causal activities: -

Energy Forces: - gravity, momentum, electrical, mechanical, chemical, pressure, noise, thermal, radiant, body movement.

Extreme Events: - flooding, industrial or bush fire, earthquake, storm, landslide,

Employee Issues: - driver comfort, weather, skills training, work requirements, PPE, safety barriers, dangerous materials.

Production issues: - construction activities, safety, operations, repairs and maintenance, production needs / capability, costs, market demands, people skills.

Business Issues: - bottom line, legal, environment, insurance, employee safety, industrial relations, environment, political, legal, regulatory, competitors, customers, and foreign exchange.

There is no best way to establish a comprehensive list of hazards or to simply recognize those issues / situations that are most likely to impact upon a specific operation. One needs to be flexible. The most important thing about this part of the system analysis is that the hazard is identified.

### 3. Analyse Risks

Determine Existing Controls Estimate Likelihood Estimate Consequences Establish Level of Risk
--

#### 3.1 Existing Controls

After establishing the potential hazard event, the next step is to consider the controls that are currently in place to minimise the impact of these events. If these controls are very effective then it may enable the significance of the event to be excluded from further analysis or, in any event, to relegate it to a low priority for further / future attention. In most cases, however, for the hazard to have been identified by the team it would indicate that the existing controls are insufficient.

#### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

Risk has been defined as the combination of the **likelihood** that an event will occur and the **consequence** of the **occurrence** of that event (moderated by the personnel exposure). This can be carried out in both qualitative and quantitative analyses. For this study, it is proposed that qualitative processes will be used. Although less definitive than the quantitative process, it is sufficient to prioritise work activity and can be done by all personnel involved in the analysis. This increases ownership of the control mechanisms and the resulting action plans.

### 3.2 Likelihood

Likelihood: Is the chance that the defined event will occur.

The “likelihood” of an event can be determined from the following table: -

Level	Descriptor	AS Description	Others comments
A	Almost certain	The event is expected to occur in most circumstances	Regular event
B	Likely	The event will probably occur in most circumstances	It has happened
C	Moderate	The event should occur at some time	I've heard it happen
D	Unlikely	The event could occur at some time	It could happen
E	Rare	The event may occur only in exceptional circumstances	Practically impossible

### 3.3 Consequence

Consequence: Is the outcome of an event or situation.

The “consequence” can be qualitatively determined from the following table: -

Level	Descriptor	AS Description	Others comments
1	Insignificant	No injuries, low financial loss	Nil impact
2	Minor	Treat by First-Aid, on-site release to environment quickly contained. Medium financial loss.	First aid
3	Moderate	Medical treatment required, on-site environmental release contained with outside assistance. High financial loss	Lost time injury
4	Major	Extensive injuries, loss of production capability, off-site environmental release with non-detrimental effects. Major financial loss	Extensive and Permanent injuries
5	Catastrophic	Death, toxic release off-site with detrimental effect. Huge financial loss	Multiple deaths

#### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

### 3.4 Exposure

Exposure: Is a measure of whether people are exposed to the hazard.

The “exposure” can be assessed as follows: -

Level	Exposure	Other Comments / Examples
100%	Continuous	Typical manned position in a quarry
50%	Frequent	Drill & Blasting operations
25%	Occasional	Sampling water for licence conditions
12%	Infrequent	Inspection of an underground sewer line
6%	Rare	
3%	Very Rare	

The exposure of personnel can be ignored in the risk assessment (ie. assume 100%)

### 3.5 Risk Ranking

Risk: The chance of something happening that will have an impact upon personnel safety. It is measured in terms of consequence and likelihood moderated by personnel exposure.

**Risk = Likelihood X Consequence** (X Exposure; if being considered)

To facilitate prioritising efforts to those highest risk issues it is proposed that the hazards are first ranked.

Risk Ranking can then be achieved using the following qualitative table: -

Risk Ranking		Consequence				
Likelihood		Catastrophic	Major	Moderate	Minor	Insignificant
Descriptor	Level	5	4	3	2	1
Almost certain	A	H	H	H	S	S
Likely	B	H	H	S	S	M
Moderate	C	H	H	S	M	L
Unlikely	D	H	S	M	L	L
Rare	E	S	M	L	L	L

Where: - H = High risk; S = Significant risk; M = Moderate risk; and L = Low risk.

### 3.6 Cumulative Risk

In some instances it is necessary to assess the risk of a particular option by accumulating the risk of each established hazard.

#### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

### 3.7 Compare against Management Criteria and set Risk Priorities

For example any risk ranked as High may require immediate action.

## 4. Treat Risks

Identify Treatment Options  
Evaluate Treatment Options  
Prepare Treatment Plans  
Implement Plan

### 4.1 Identify Treatment Options

When considering treatment options there is a hierarchy of effectiveness worth considering.

Treatment	Comment	Effectiveness
Elimination	Engineer out Eliminate process, method, or material	100%
Substitution	Replace the process, method or material with a less hazardous one	75%
Separation	Isolate the hazard by guards, space or time separation	50%
Administration	Adjust time or conditions of risk exposure	30%
Training	Improve skills to make tasks less hazardous	20%
PPE - Personal Protective Equipment	Use appropriately designed and fitted equipment	10%

### 4.2 Evaluate Treatment Options

What are the costs of the treatment options?

Has it reduced the risk to acceptable levels?

Has it met the criteria for the study?

How does it compare to other treatment opportunities for this hazard?

#### **Extractive Consulting,**

311 Kinglake-Glenburn Road, Kinglake, Victoria, Australia 3763

Phone: +61 3 5786 2174 Facsimile: +61 3 5786 1864 Mobile: 0417 782 781

### **4.3 Prepare Treatment Plans**

### **4.4 Implement Plan**

What is to be done?

Who will take responsibility for part / all of the treatment works?

When will the treatment be completed?

What interim measures are required?

How will activity / completion be reported?

Who will check progress and / or audit the ongoing process?



This example has been prepared as a guide when discussing the development of a Risk Management process within a contact mining / quarrying company.