

International Mining for Development Centre  
Mining for Development: Guide to Australian Practice

# The Management of Occupational Health and Safety in the Australian Mining Industry

David Cliff



Australian Government  
AusAID



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA



THE UNIVERSITY OF  
WESTERN AUSTRALIA

The **International Mining for Development Centre** has been established to promote more sustainable use of minerals and energy resources in developing nations by assisting governments and civil society organisations through delivery of education and training, fellowships, research and advice. Our focus is on three core themes of Governance and Regulation, Community and Environmental Sustainability, and Operational Effectiveness.

**Prepared by Professor David Cliff**

Director - Mineral Industry Safety and Health Centre  
Sustainable Minerals Institute  
The University of Queensland, Australia

**This report does not necessarily represent the views or the policy of AusAID or the Commonwealth of Australia.**



# Introduction

Mining Occupational Health and Safety (OHS) legislation in Australia is generally viewed as being the most progressive in the world. The legislation is based upon duty of care, risk management principles and workforce representation, with the primary responsibility for the provision of a safe work place residing with the operator of the mine site. Government inspectors act as both enforcers of regulations and mentors who encourage good health and safety performance. Enforcement protocols are generally risk-based, with action being defined by both the level and immediacy of the risk.

Each state in Australia has established its own legislative framework, generally incorporating regulations that encourage the development of management systems and key processes. More prescriptive or rule-based regulations are still used in areas where the various stakeholders (government, employers and workers) are not comfortable removing compliance requirements. State legislation has been influenced by recent initiatives including national model OHS legislation, and a National Mine Safety Framework.

The Australian industry has adopted a strong focus on OHS management for a number of intersecting reasons, including:

- Legal requirements. The shift from compliance to management requirements of mining and general OHS legislation has required companies to invest significant resources in appropriate systems
- Financial incentives. There is a business case for a safe workplace, including the minimisation of Workers Compensation premiums and reduction in the costs of managing injuries and illness
- Corporate commitments. Many companies have introduced corporate policies that commit them to eliminating injuries and harm in the workplace
- Additional benefits. Proactive management of OHS can create a positive work environment, which in turn can lead to increased productivity.

This paper provides an overview of the evolution of OHS theory and practice, and describes how these have been applied in the context of the Australian minerals industry.

## The evolution of OHS theory and regulation

### Early studies

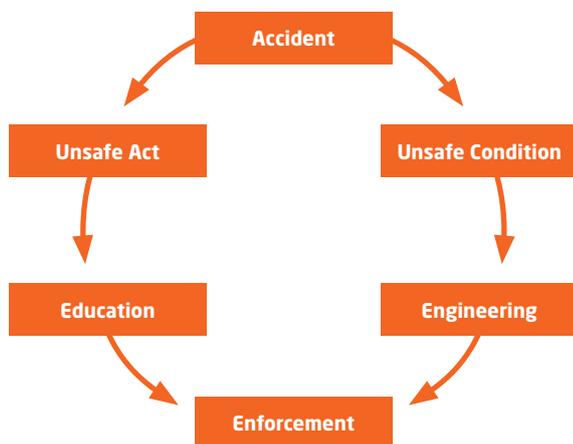
A well-known early study into safety management was undertaken by American engineer H. W. Heinrich in 1931 and is usually referred to as Heinrich's Domino Theory. He identified a chain of events and circumstances that ultimately lead to injury:

- Environmental factors
- Fault of the individual
- Unsafe act or condition
- Accident, and
- Injury.

**Heinrich analysed a large number of industrial accidents and determined that 88% were due to unsafe acts, and only 10% due to unsafe conditions.** This finding has formed the basis of much subsequent OHS management theory.

A similar finding emerged from the development of the *Safety Engineering Model (SEM)*, as shown in Figure 1 below. In this model, developed in the United States of America, researchers confirmed a similar balance in terms of unsafe acts (85%) and unsafe conditions (15%). The researchers further suggested that unsafe acts are best prevented through education and enforcement, whereas unsafe conditions are best prevented through improved engineering practices and enforcement of these practices.

Figures 1: Safety Engineering Model (SEM)



The addition of management and worker behaviour to the basic model included a focus on the following elements:

- Empowerment of workers
- Adoption of progressive labour practices
- Promotion of health and safety as a personal and organisational value
- Development of positive worker attitudes, with a focus on behaviour modification, and
- Application of ergonomic and human factor analyses.

In addition, a focus on occupational health in the workplace was added to the framework. This introduced an emphasis on protecting and promoting the health of employees in the workplace. Key aspects included:

- Prevention and control of occupational diseases and accidents
- Development and promotion of a healthy and safe workplace
- Enhancement of the physical, mental and social wellbeing of employees, and
- Empowerment of employees to conduct socially and economically productive lives.

**These early studies and developments created the platform for the emergence of a more systematic approach to OHS in the workplace.**

### Evolution of approaches to OHS regulation

Early OHS regulation could be characterised as being uniformly prescriptive, with an emphasis on detailed and highly technical specifications and standards, and with compliance to rules enforced by government-funded independent inspectorates with broad inspection powers.

The advantages of this type of approach were that organisations knew exactly what the requirements were, and the legislation was relatively easy to enforce. Simply, workplaces were deemed to be safe if they complied with the regulations.

**However, experience with such rigid approaches also identified a number of weaknesses, with a number of reviews and investigations highlighting the following issues (adapted from National Research Centre for OHS regulation 2012):**

- The large number of detailed and technical rules were often difficult to understand, and also challenging to keep current
- Standards were often developed in an ad hoc manner
- Regulations often featured a focus on physical hazards only
- There was uneven coverage across different types of workplaces
- There was no encouragement for organisations to be innovative, as the compliance approach focused on minimum standards rather than excellence
- The prescriptive approach usually ignored the fact that hazards may not arise from static features of workplace, but also from the way that work is organised, and
- There was a dependence on top-down regulation, with little involvement of other stakeholders such as workers and unions.

A watershed for global OHS legislation and practice occurred in 1972, when Chair of the National Coal Board in the United Kingdom, Lord Robens, delivered a report into Safety and Health in Work in the UK, carried out by a Parliamentary committee which he chaired. The key findings of the Robens report (*Report of the Committee on Safety and Health at Work, London: Majesty's Stationery Office, 1972*) included that there was too much law in OHS, and the area needed to be simplified. Broad framework law should be supported by specific regulations, codes of practice and guidance where necessary. Crucially, Lord Robens found that the balance between "prescriptive" and "goal-setting" legislation needed to shift towards the latter and encourage self regulation. Accompanying this last point were recommendations that the OHS Inspectorate undergo significant reform to adapt to these changes in approach.

### The Management System approach

Occupational Health and Safety Management Systems (OHSMS) were developed in the aftermath of a number of well-documented, serious industrial accidents during the 1970s and 1980s. These include the 1974 Flixborough Accident, the 1976 Seveso incident and the 1987 Piper Alpha disaster.

Investigations into these incidents highlighted deficiencies in prevailing approaches to the management and regulation of OHS, and identified the need to adopt approaches which systematically addressed both education and engineering responses.

**The introduction of management systems provided a framework and structure for the development, implementation and review of the plans and processes necessary to manage OHS in the workplace.** Since the emergence of such systems in the 1970s, considerable development of the approach has occurred, driven by recognition of the following:

- OHS is affected by all aspects of the design and workings of an organisation
- The design and management of health and safety systems must integrate environment, people and systems in proportions that reflect an organisation's unique characteristics (no one system is universally effective)
- Health and safety is a management function, and requires extensive management commitment and involvement
- Unifying elements produce a set of defined responsibilities and accountabilities for those activities at all levels of the organisation
- Incidents, injuries and illnesses are an indication of a problem in the system and are not simply about human error, and
- Performance goals must reflect management objectives.

In line with the development of the management system approach for areas such as quality and environmental

management by the International Standards Organisation, there is a series of accepted international OHS standards, including:

- OHSAS 18001: 2007 - Occupational Health and Safety Management Systems - Requirements, and
- OHSAS 18002:2008 - Occupational Health and Safety Management Systems - Guidelines for the implementation of OHSAS 18001:2007.

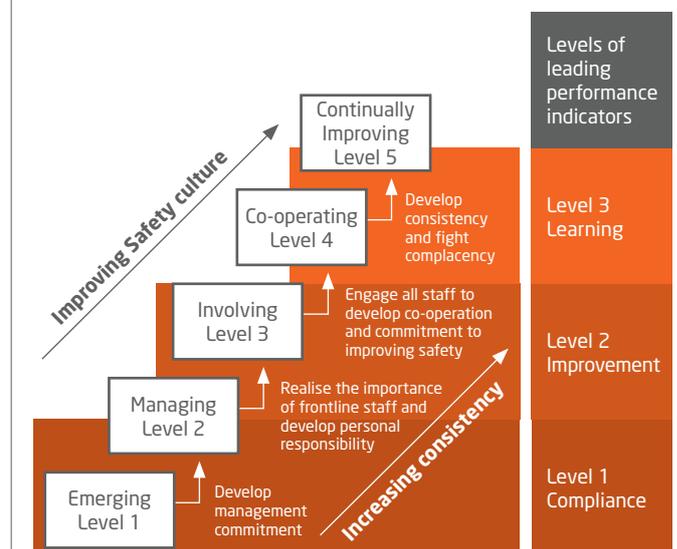
Many organisations combine the various topical standards (Quality, Environment, OHS) into a single Integrated Management System, as there are a large number of common elements.

### Maturity models

The most recent inclusion in OHS management is the recognition of **organisational culture** and its relationship to OHS management styles. A number of researchers and organisations have investigated the influence of company culture on OHS performance, and applied the concept of *Maturity Models* to this area.

In this model, improving OHS culture can be characterised in terms of a number of ascending steps as shown in Figure 2. Analytical tools can be applied to assess performance against different management and organisational elements to identify current position on the maturity ladder. Several large resources companies have applied this model to engage all employees in improving OHS performance and culture.

Figures 2: Safety Culture Maturity Model (from Step Change in Safety)



## Mining OHS legislation in Australia

### Development and harmonisation

Historically, each state and territory in Australia has managed OHS separately, with its own general legislation applicable to most workplaces. This general legislation was often supplemented by special mining legislation or additional regulations. In the case of Queensland and Western Australia, the general legislation was not applicable, instead replaced by mining-specific OHS laws for mine sites.

However, in recent years there has been a concerted effort led by the federal government to harmonise the various state mainstream OHS legal frameworks through the development of model legislation. The model work health and safety legislation consists of an integrated package of a model Work, Health and Safety (WHS) Act, supported by model Work, Health and Safety (WHS) Regulations, model Codes of Practice and a National Compliance and Enforcement Policy. Each state government has given an undertaking to revise its legislation to be consistent with these models. Commencing in January 2012, state governments will introduce OHS legislation consistent with the national model legislation.

The major mining states - WA, NSW and QLD - have elected to retain specific mining OHS legislation. In NSW this will be applied in addition to the general OHS legislation, whereas in QLD and WA the mining OHS legislation will replace the general OHS legislation. In all cases the individual pieces of legislation will embody the essential features of the model legislation, bringing much more consistency across Australia.

Other special legislation may also be applicable to specific aspects of mine safety - for example, regarding management of dangerous goods, including explosives. Table 1 below summarises legislative coverage in Australia. Although not indicated in the table, separate legislation is also often applied to coal and metalliferous mining operations.

In addition to the harmonisation of general OHS legislation, the Ministerial Council on Mineral and Petroleum Resources has developed the National Mine Safety Framework (NMSF), which aims to achieve a nationally consistency occupational health and safety regime for the Australian mining industry. The objective of the NMSF is to improve the safety of workers through greater consistency and efficiency of occupational health and safety regulation.

The Ministerial Council first endorsed the initiative in March 2002. It established a tripartite Steering Group made up of representatives of state/Northern Territory and Australian Governments and relevant industry associations and trade unions, to guide the development and implementation of the Framework. The NMSF is made up of seven strategies, focussed on key areas where consistency across jurisdictions would be most beneficial to the industry:

- Nationally consistent legislation
- Competency support
- Compliance support
- A nationally coordinated protocol on enforcement;
- Consistent and reliable data collection and analysis
- Effective consultation mechanisms, and
- A collaborative approach to research.

The NMSF Steering Group has developed implementation plans for the seven strategies through a consultative process involving all major stakeholders. The Steering Group’s recommendations were finalised in the *“National Mine Safety Framework Implementation Report”* in October 2008, and subsequently endorsed by the Council of Australian Governments. The National Mine Safety Framework Secretariat is also working closely with Safe Work Australia regarding the implementation of the National Mine Safety Framework, and the interaction between the NMSF and the National OHS Harmonisation process to ensure a consistent and collaborative approach. (DRET 2012)

**Table 1: Examples of state coverage of OHS legislation to mining operations in Australia**

	NSW	QLD	VIC	SA	NT	TAS	WA
<b>OHS</b>	✓		✓	✓	✓	✓	
<b>Mining</b>	✓	✓					✓
<b>Dangerous Goods</b>	✓		✓	✓	✓	✓	✓
<b>Other</b>	✓ electrical	✓ equipment	✓ equipment building health		✓ radiation	✓ radiation	✓

## Legislative approach and focus

Early in the 1990s a reform process was initiated for mining legislation across Australia, with major disasters such as the Moura No.2 Mine explosion in 1994 providing additional impetus. In line with the findings of the Robens report, there was a push to move from prescriptive to more enabling legislation. **Reflecting the shift from compliance to self-management, greater emphasis was placed on the legislation on duty of care, risk management principles and workforce representation.** As discussed earlier, this shift places the primary responsibility for the provision of a safe work place with the operator of the mine site.

With the emergence of model legislation and the NMSF, the balance between compliance and self-managed aspects of legislation continues to be explored. Although the legislation is not yet uniform between the states, there is considerable similarity in the more prescriptive regulations (MISHC 2012). Examples include the following:

- New South Wales coal legislation is markedly similar to the Queensland legislation in terms of major (principal) hazard management. Both the coal and the metalliferous act and regulations in NSW are subordinate to the mainstream OHS act. The metalliferous act and regulations also contain a much greater emphasis on management systems and risk management principles.
- Queensland mining legislation is overtly focussed on OHS management, with an emphasis on safety management systems and risk management. There is separate coal and non-coal legislation.
- In Western Australia, there is only one mining safety act and associated regulations covering both metalliferous and coal, with largely prescriptive content.

In the mainstream OHS legislation, safety management systems are usually only required for major hazardous facilities or mines. In these applications, the focus of the management system is usually on the prevention of catastrophic events.

In each state legislation is supported by a hierarchy of other documents with varying degrees of legal status including:

- Codes of practice or recognised standards. These are advisory documents that aim to provide practical guidance. They do not have the same status as regulations and may be used by courts as the standard when assessing other methods or practices used. The key is attainment of the same or better level of risk protection. For example: the West Australian 'Code of Practice on Working Hours'.
- Guidelines. These are explanatory documents. They provide more information about the requirements of legislation, detail good practice and may explain means of compliance with standards prescribed in the legislation. Compliance with guidelines is not mandatory, however they could have legal standing if it were demonstrated that the guideline is the industry norm. For example: the West Australian 'Emergency preparedness for underground fires in metalliferous mines'.

- Guides and procedures. These are documents aimed at assisting mines in complying with the requirements of the legislation. For example: Queensland Guidance Note 'Development of effective Job Safety Analysis'.
- Australian Standards. A number of AS are explicitly cited in the legislation and as such compliance with the requirements of these standards is important. For example: AS/NZS 2865-2001 Safe working in a confined space. Other Australian standards not explicitly cited would have the same standing as guidelines and could act as industry norms.

An example of the way in which different elements, including supporting documents, are used to manage risk, and also achieve a balance between prescriptive and self-regulatory approaches, can be seen in the legislation applied to the management of methane in underground coal mines in Queensland.

## Management of Methane

Legislation requires the following:

- A ventilation plan - it is the mine's responsibility to specify details, and the plan is reviewed by regulators for adequacy, and
- A gas management plan - again, it is the mine's responsibility to specify details, and the plan is reviewed by regulators for adequacy.

Legislation specifies:

- Various types of explosion risk zones
- Maximum allowable methane concentration and type of equipment allowed in each zone
- Requirements for machinery to have methane detectors on-board that will cut-off power to the machine, and
- Use of flameproof and intrinsically safe equipment in explosion risk zones.

Legislation refers to guidelines for:

- Requirements for methane drainage pre-mining, during operation, and post-mining, and
- Requirements for inertisation of panels during sealing.

The introduction of less prescriptive regulations means that change can be introduced more quickly to account for shifting technological developments. However, there is sometimes criticism that, because the underpinning guidelines and codes of practice are not subject to Parliamentary scrutiny, change can occur with little consultation and review.

## Australian Standards and Occupational Health and Safety Management Systems

There are two Australian Standards covering Occupational Health and Safety Management Systems:

- **AS/NZS 4801:2001** Occupational health and safety management systems - Specification with guidance for use, and
- **AS/NZS 4804:2001** Occupational health and safety management systems - General guidelines on principles, systems and supporting techniques.

AS 4801:2001 *Occupational health and safety management systems* defines an OHSMS as part of the overall management system, which includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the OHS policy, and so managing the OHS Risks associated with the business of the organisation.

AS4804:2001 *Occupational health and safety management systems* outlines general guidelines about principles, systems and supporting techniques:

- How to set up an OHSMS
- How to continually improve an OHSMS, and
- Resources required to set up and continually improve an OHSMS.

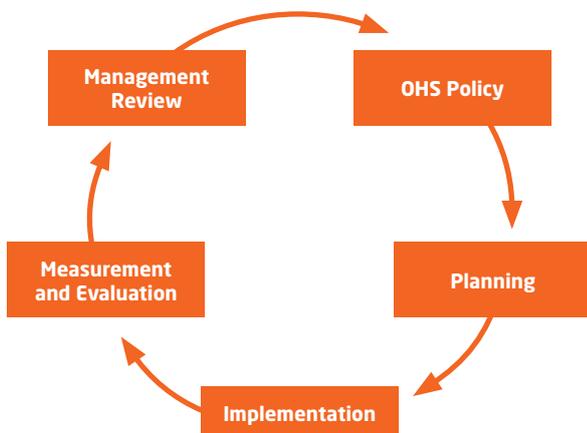
As with a number of Australian Standards dealing with Management systems, AS/NZS 4801 and 4804 are closely aligned with the relevant international standards dealing with similar issues. The process and principles are summarised in Figure 3 below.

The various state legislations have differing requirements or specifications for OHS Management Systems. These range from no explicit requirement in WA to safety case requirements in Victoria.

As an example, NSW Guidance Note GNC-003 *Preparing a health and safety management system* provides guidance to operators of coal mine regarding the duty to prepare a health and safety management system, consistent with AS 4804. An OHSMS is required under section 20 of the Coal Miner Safety and Health Act 2002. An overview of the contents of an OHSMS under NSW legislation is given in Chart 1 below, extracted from the guidance note.

The Queensland legislation provides less detailed guidance on the content of the OHSMS, but is again consistent with AS4804. All workers need to be competent for the work they are doing and the OHSMS needs to include procedures and processes to ensure training is provided and controlled to ensure competent workers.

Figure 3: OHSMS as per AS4804.1



**Chart 1: Health and safety management system contents**

<b>Health and Safety Management System</b>				
<b>System elements</b> Section 23(3)(a) of Act	<b>Major hazard management plans</b> Section 23(3)(b) of Act Note: Clause 28-38 of Reg	<b>Management structure</b> Section 23(3)(c), and Section 37-38 of Act	<b>Contractor management plan</b> Section 23(3)(d), and Section 40 of Act	<b>Components required by the regulations</b> Section 23(3)(e) of Act
<p>Including:</p> <ul style="list-style-type: none"> <li>• Health and safety policy</li> <li>• Risk management</li> <li>• Training and competence</li> <li>• Information control</li> <li>• System evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Slope stability</li> <li>• Surface transport</li> <li>• Underground transport</li> <li>• Strata failure (U/G)</li> <li>• Inrush (U/G)</li> <li>• Fire and explosion (U/G)</li> <li>• Dust explosion (U/G)</li> <li>• Explosives</li> <li>• Airborne dust</li> <li>• Outburst of Coal and Gas (U/G)</li> <li>• Spontaneous combustion (U/G)</li> </ul>	<ul style="list-style-type: none"> <li>• Nominates people within the structure by position and outlines their areas of responsibility and accountability</li> <li>• Identifies, by means of an organisation chart, people responsible for major functions in the management structure of the operation</li> <li>• Includes a register, kept at the on-site office of the coal operation, containing names of people occupying positions in the management structure</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-assessment of contractor health and safety arrangements (including safety management, competence of people and fit for purpose plant) prior to engagement</li> <li>• Site induction of contractors, contractor employees and subcontractors</li> <li>• Monitoring of contractor compliance with site health and safety requirements, including compliance with the Act and Regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Inspection program</li> <li>• Information and communication arrangements</li> <li>• Supervision arrangements</li> <li>• Monitoring arrangements (U/G)</li> <li>• Electrical engineering management plan</li> <li>• Mechanical engineering management plan</li> <li>• Withdrawal conditions</li> <li>• Ventilation arrangements (U/G)</li> </ul>

## Key aspects of modern mining OHS Legislation

### Risk Management

The key to the implementation of modern OHS legislation is the requirement to reduce health and safety risks to workers to as low as reasonably possible. The legislation does not specify the definition of acceptable levels – rather, the onus is on the mine operator to establish risk levels. Risk management is an ongoing process of:

- Identification of potential hazards
- Assessment of the level of risk
- Development and implementation of controls necessary to reduce the risk to an acceptable level
- Monitoring of the effectiveness of controls, and
- Assessment and monitoring of the level of residual risk.

### Duty of Care

Modern Australian legislation requires companies and workers to exercise a “duty of care”, which means that:

- An employer must, as far as practicable, provide a work environment in which employees are not exposed to hazards, and must provide information, instruction, training and supervision
- Employees must take reasonable care for their own safety and health, and that of others at work
- Self employed persons must, as far as practicable, ensure that their work does not adversely affect the safety and health of others, and
- Suppliers have a duty of care to supply equipment, goods and services that are not only fit for purpose but also do not adversely affect the safety and health of workers.

The duty of care is shared between employer and employee. However, primary responsibility rests with the employer, who largely has control over working conditions. The duty owed by the employer may be higher to an employee who is inexperienced than to one who has experience. Similarly, high duty of care exists in hazardous environments.

The employer has a duty of care to employees and others to provide:

- Reasonably competent staff
- Sufficient workers to carry out work safely
- A safe place of work
- Proper equipment, and
- A safe system of work.

**Duty of care encourages management of OHS rather than compliance with regulation.**

### Implementation and monitoring

Monitoring the effectiveness of the implementation of the legislation and OHS management systems occurs in many ways.

Legislation requires the reporting of all accidents and significant incidents, injuries and serious illnesses. These can be analysed to identify underlying causes. Significant incidents not only indicate the potential for an injury or fatality but also the potential for hazardous circumstances to exist – for example, accumulations of flammable gas, unstable strata, inadequate ventilation or high dust levels.

In addition, the legislation requires that mine sites undertake regular audit and review processes, which are subject to scrutiny by the regulator. The regulator can make spot checks and high level audits of the OHS Management System. Most mine sites use accredited third party auditors to review their systems.

### Stakeholder involvement

**An integral part of the modern Mining OHS legislation is the inherent role that the workforce plays in implementing OHS management.** This occurs in a range of ways.

At the highest level, the responsible minister in each state is advised by a tripartite advisory council (government, employer and employee). These boards have the power to define training competencies and provide advice to the minister about reforms to the legislation.

At each mine site there are OHS committees with workforce representation that have input into the development of safety procedures and plans. There are generally site safety and health representatives, elected by the workforce. These representatives have limited powers to review procedures and plans but can direct workers to leave a place of work deemed unsafe. These representatives are usually the first point of contact for a worker with OHS concerns. The representative will raise the issue with mine management. If he or she cannot obtain satisfactory resolution, he or she can forward the complaint to a mines inspector or the industry-wide workforce representative for further action.

Further, in most states there are a small number of workforce representative inspectors (referred to as industry safety and health representatives, district worker representatives, or check inspectors) who are appointed by the government, usually on advice from the relevant mining union. These officers have similar powers to government inspectors, and may be contacted directly by workers where there are concerns about health and safety.

The risk assessment process involves consulting with an appropriate cross-section of the workforce and external expertise in order to identify and characterise the potential hazards at a mine site.

# Conclusion:

The management of OHS in the Australian mining industry is principally based upon the development and implementation of OHS management systems. The evolution of relevant legislation has placed greater emphasis on concepts of risk management and duty of care, with more prescriptive and compliance-driven approaches retained in some areas.

This shift has placed the principal responsibility on OHS in the workplace on mine operators, supported by government inspectors who police the regulations where necessary but also act as mentors to encourage improvement in OHS performance.

Improving an organisation's OHS performance requires the co-operation of all employees. This can only be achieved if there is good communication of the plan and the implementation process.

It is important to recognise that the knowledge and experience of the workforce is a valuable resource. Using this knowledge and experience to develop an effective OHS Management System through consultation and involvement in determining desired outcomes and targets provides a good foundation for the implementation process.

OHS Management Systems not only identify all hazards and risks to be managed, but provide guidelines for how they are to be managed, who is responsible for implementing actions, what resources are required, and the level of training required to properly implement the plans. They also identify the monitoring and review requirements necessary to keep the system effective and appropriate.

## REFERENCES

- Mineral Industry Safety and Health Centre (2012). 'Compliancegate database', <http://www.mirmgate.com.au/index.php?gate=compliancegate>. Accessed 8/1/12
- NSW Department of Primary Industries (2007). "Preparing a health and safety management system", <http://www.dpi.nsw.gov.au>
- National Research Centre for OHS Regulation (2012), "About occupational health and safety regulation in Australia", <http://ohs.anu.edu.au/ohs/index.php> accessed 8/1/12
- Robens L, (1972). "Report of the Committee on Safety and Health at Work", London: Majesty's Stationery Office.
- Step Change in Safety (2011) "Leading Performance Indicators", <http://www.stepchangeinsafety.net> accessed 8/1/12



## Contact

### **International Mining for Development Centre**

Perth, Western Australia  
Australia 6009  
Email: [admin@im4dc.org](mailto:admin@im4dc.org)

[www.im4dc.org](http://www.im4dc.org)

### **The Energy and Minerals Institute**

The University of Western Australia  
M460A, 35 Stirling Highway  
Crawley, Perth  
Western Australia, Australia 6009  
Tel: +61 8 6488 4608  
Email: [emi@uwa.edu.au](mailto:emi@uwa.edu.au)

### **The Sustainable Minerals Institute**

The University of Queensland  
St Lucia, Brisbane  
Queensland, Australia 4072  
Tel: +61 7 3346 4003  
Email: [reception@smi.uq.edu.au](mailto:reception@smi.uq.edu.au)