



Australian Government

Department of Education, Employment and Workplace Relations

RIIMCU502A Implement the gas management plan

Release: 1

RIIMCU502A Implement the gas management plan

Modification History

Not applicable.

Unit Descriptor

This unit covers the implementation of the gas management plan in the coal industry. It includes planning and preparing for the implementation of the gas management plan, implementing mine gas monitoring measures, implementing ventilation/gas control measures, and auditing gas management systems. Licensing, legislative, regulatory and certification requirements that apply to this unit can vary between states, territories, and industry sectors. Relevant information must be sourced prior to application of the unit.

Application of the Unit

This unit is appropriate for those working in a management or supervisory role at worksites within:

- Coal mining

Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and prepare for the implementation of the gas management plan	1.1. Access, interpret and apply compliance documentation relevant to the work activity 1.2. Access, interpret and clarify the legislative and site requirements related to gas management systems 1.3. Access, interpret and clarify the gas management plan 1.4. Identify and communicate roles and responsibilities, as specified in the gas management plan to all involved persons 1.5. Identify, forecast, obtain and allocate/schedule resources required for the implementation of the gas management plan 1.6. Identify training needs 1.7. Encourage, receive, review and, where appropriate, implement suggestions and recommendations for changes to gas management procedures
2. Implement mine gas monitoring measures	2.1. Identify, measure and interpret the impact of changes in composition, the concentration of gas and gas make , and associated hazards on the mine atmosphere 2.2. Implement procedures for the installation, operation and maintenance of gas monitoring systems 2.3. Implement systems and procedures for the collection and analysis of gas samples 2.4. Record and report monitoring system data in accordance with the gas management plan 2.5. Investigate changes in mine atmosphere status and implement appropriate corrective action and record and process reports
3. Implement ventilation/gas control measures	3.1. Monitor mine factors and action in accordance with the gas management plan 3.2. Implement gas hazard control procedures associated with gas drainage, outburst mining conditions and the gas management plan 3.3. Identify and implement appropriate

	response procedures in situations where trigger levels are reached 3.4. Implement ventilation and gas monitoring systems and surveys to assess the status of the systems 3.5. Implement procedures covering the relocation, operation and maintenance of drilling rigs and gas drainage infrastructure according to site requirements 3.6. Implement systems to prevent and/or respond immediately to the intersection of current and other workings 3.7. Implement gas emergency and evacuation procedures in accordance with the Mine Safety Management System 3.8. Implement the gas management training plan
4. Audit gas management systems	4.1. Review the effectiveness of the gas management systems in accordance with the requirements of the gas management plan 4.2. Audit mine gas monitoring systems operations for compliance with legislative requirements and the gas management plan 4.3. Audit mine gas control devices for compliance with legislative and mine site requirements 4.4. Audit recording systems for compliance with the gas management plan 4.5. Audit the maintenance program and procedures for compliance with the gas management plan 4.6. Audit gas emergency and evacuation procedures for compliance with the mine safety management system 4.7. Audit the gas management training plan for currency, relevance and compliance with the gas management plan

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Specific skills are required to achieve the Performance Criteria of this unit, particularly for its application in the various circumstances in which this unit may be used. This includes the ability to carry out the following, as required to implement the gas management plan:

- apply legislative, organisation and site requirements and procedures for implementing the gas management plan
- access, interpret and apply technical information
- access and analyse gas information related to the mine including archival and historical information
- interpret and apply mathematical and scientific theorems / laws related to gas
- collect, collate and evaluate gas management data
- conduct investigation and prepare reports
- communicate effectively in the workplace
- access, evaluate and apply data from monitoring systems and equipment
- operate hand held monitoring equipment
- implement gas management training requirements, programs, systems and procedures
- apply risk management processes and techniques

Required knowledge

Specific knowledge is required to achieve the Performance Criteria of this unit, particularly for its application in the various circumstances in which this unit may be used. This includes knowledge of the following, as required to implement the gas management plan:

- legislative and site requirements for gas management including air quality and quantity, maximum and minimum values, control and distribution, flammable gas limits, ventilation fans, gas monitoring, inspections and recording / reporting
- the methods of mine ventilation and their applications / limitations including exhaust / force, antitropical, homotropical, flank returns, ascensional / decensional, bleeder, Z/U/Y systems and other combinations
- the methods of panel gas management and their applications / limitations including homotropical and antitropical (and in conjunction with these, the use of goaf bleed or back return), auxiliary fans, coursed ventilation (narrow side / wide side), machine mounted scrubber systems, compressed air venturis and bleeders
- the impact of mining techniques
- the impact of mine and panel design on gas management
- the impact of differing geological features and conditions on gas management including faults, dykes, intrusions and strata deformities

- the impact of coal characteristics and coal seam gradients on mine gas management systems
- mine gases; the types and their characteristics, sources, physiological effects and methods of detection
- mine fires; the types and possible impacts on gas management
- mine explosions; the types, ignition sources and possible impacts on gas management
- pressure changes; causes and the impacts on gas management
- heat / humidity; the sources and factors which may impact on mine gas management
- mine fans; fan types, applications and limitations
- gas control devices; the types, purposes, design criteria and specifications, distribution / placement criteria and limitations
- de-gassing; methods of control - including brattice, auxiliary fans, compressed air venturis, sails, hurdles and bleeders
- fixed gas monitoring systems types, uses and limitations
- portable monitoring equipment, types, characteristics, uses and limitations
- computer-based systems for mine gas analysis
- Gas Management Plan development requirements and processes
- techniques for determining alarms and trigger points / levels
- audit and review processes and techniques
- site document control requirements
- emergency response and evacuation procedures
- the general use and application of ventilation theory including
 - gas laws including Charles and Boyle
 - natural ventilation
 - Coward's Triangle
 - Graham's Ratio
 - Ellicott Diagram
 - gas make
 - Trickett's Ratio
 - leakage
 - psychrometry and heat
 - CO/CO₂
 - Kirchoff's laws
- geological data
- the impact of differing geological features and conditions on outburst including faults, dykes, intrusions and strata deformities
- methods of control of outburst
- the methods of gas drainage and their applications / limitations against the mine design, mine and panel ventilation systems, systems of mining and current and future mine development

- the impacts of gas drainage on dust generation during mining
- impacts of intersecting and intersected holes and hole design
- principles of ventilation management
- mine and goaf ventilation systems
- underground water management techniques
- site environmental monitoring requirements
- risk management procedures
- inertisation techniques

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	The evidence required to demonstrate competency in this unit must be relevant to worksite operations and satisfy all of the requirements of the performance criteria, required skills and knowledge and the range statement of this unit and include evidence of the following: • knowledge of the requirements, procedures and instructions for implementing the gas management plan • implementation of procedures and techniques for the safe, effective and efficient implementation of the gas management plan • the identification of the relevant information and scope of the work required to meet the required outcomes • the identification of viable options and the selection of gas management plan elements that best meet the required outcomes • working with others to undertake and complete the implementation of the gas management plan • consistent successful implementation of the gas management plan
Context of and specific resources for assessment	• This unit must be assessed in the context of the work environment. Where personal safety or environmental damage are limiting factors, assessment may occur in a simulated environment provided it is realistic and sufficiently rigorous to cover all aspects of workplace performance, including task skills, task management skills, contingency management skills and job role environment skills. • Assessment of this competency requires typical resources normally used in a resources and infrastructure sector environment. Selection and use of resources for particular worksites may differ due to the site circumstances.

	• The assessment environment should not disadvantage the participant. For example, language, literacy and numeracy demands of assessment should not be greater than those required on the job. • Customisation of assessment and delivery environment to sensitively accommodate cultural diversity. • Aboriginal people and other people from a non English speaking background may have second language issues. • Where applicable, physical resources should include equipment modified for people with disabilities. Access must be provided to appropriate learning and/or assessment support when required.
Method of assessment	This unit may be assessed in a holistic way with other units of competency. The assessment strategy for this unit must verify required knowledge and skill and practical application using more than one of the following assessment methods: • written and/or oral assessment of the candidate's required knowledge to apply in undertaking of the implementation of the gas management plan • observed, documented and/or first hand testimonial evidence of the candidate's: • implementation of appropriate requirement, procedures and techniques for the safe, effective and efficient achievement of required outcomes • identification of the relevant information and scope of the work required to meet the required outcomes • identification of viable options and the selection of gas management plan elements that best meet the required outcomes • consistent achievement of required outcomes • first hand testimonial evidence of the candidate: • working with others to undertake and complete the implementation of the gas management plan

	• provision of clear and timely required support and advice on the implementation of the gas management plan
Guidance information for assessment	Consult the SkillsDMC User Guide for further information on assessment including access and equity issues.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Relevant compliance documentation may include:	• legislative, organisational and site requirements and procedures • manufacturer's guidelines and specifications • Australian standards • Employment and workplace relations legislation • Equal Employment Opportunity and Disability Discrimination legislation
Interpret is defined as: the understanding needed by the person within their job role.	
Gas Management Plans establish procedures for maintaining a safe environment may include:	• hazard identification and quantification • risk assessment • authority and responsibility • controls established to manage identified risks • reporting and communication • document control • audit and review <i>And may include procedures for:</i> • mine atmosphere monitoring • ventilation systems and usage • inertisation techniques • mine plan • trigger action response plans • emergency procedures • training and education
Gas management training applies to:	• mine workers • tradespeople • permanent employees • contractors • mine officials • other special requirements
Gas management procedures may include those for:	• construction • action response

	• permit to work/mine • condition monitoring • auditing • maintenance • atmosphere monitoring • ventilation system control • communication systems • survey procedures • sealing procedures • changes • training and recording/reporting
Hazard is defined as: <i>a source of potential harm or a situation with a potential to cause loss</i> (definition from AS/NZS 4360:1999 Risk Management).	
Hazards may include:	• irrespirable atmosphere • noxious atmosphere • flammable or explosive mixtures • outburst
Mine Atmosphere refers to the atmosphere in all areas in the general mine ventilation district and beyond into waste working and goafs / gobs in the mine.	
Action (alarm or trigger) level is a generic term used to describe a level determined at the mine site at which pre-determined action is initiated or a response made.	
Audit is defined as: <i>a systematic examination against defined criteria to determine whether activities and related results conform to planned arrangement, and whether these arrangements are implemented effectively and are suitable to achieve the organisation's policy and objectives</i> (AS/NZS 4804: 2001).	

Risk is defined as: <i>the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood</i> (definition from AS/NZS 4360:1999 Risk Management).	
Principles of mine design may include:	• recovery • reserve optimisation • mining direction • geological structures • ventilation • strata control • mining method • productivity • environmental considerations • access
Standard operating procedures (SOP) are also known as safe working procedures, safe operating procedures and standard working procedures.	
Mine gases may include:	• seam gases • methane • carbon dioxide • oxides of nitrogen • hydrogen • carbon monoxide • sulphur dioxide • hydrogen sulphide • hydrocarbons • contaminations • normal atmosphere gases
Gas make characteristics may include:	• gas content • gas pressure • absorption • desorption • hydrostatic pressure • strata moisture content • permeability and porosity

	• tectonic stress
Gas make characteristics may include:	• stoppings • overcasts • regulators • preparation seals • ventilation doors • bulk heads • goaf seals • final seals • pressure chambers • air locks
Explosion control devices may include:	• water barriers • stone dust barriers • trickle dusters • calcium chloride • stone dust • triggered barriers
Gas management devices and methods may include:	• gas drainage • infusion • scrubbers • automatic gas detectors • tube bundle systems • de-gassing device on auxiliary fans • gas monitoring systems
Geological conditions may include:	• faults • dykes • intrusions and strata deformities • existing or induced stress or strain • depth of overlaying strata • adjacent coal seams
Coal seam characteristics may include inherent factors such as:	• rank • petrology • moisture • particle size • seam gas - composition and content • pyrites • permeability <i>Or depositional factors such as:</i> • seam thickness • multiple and rider seams • seam dip

	• depth of cover • cleats • friability
Geological and physical conditions of the seam and surrounding strata which may contribute to outburst potential may include:	• cutters • changing cleat • coal colour
Mine atmosphere monitoring may include:	• continuous monitoring • portable (hand held) monitoring • collection of bag samples • gas chromatography • ventilation measurements from all area of the mine including sealed areas • waste workings
Infrastructure may include:	• pipes • valves • hoses • pumps • drainage plant • flame arresters • power supply to bore holes • cleaning equipment
Types of fires may include:	• solid • liquid • gas
Ignition sources may include:	• electrical • static discharge • friction • contraband • spontaneous combustion • naked flame • chemical • explosives
Disruptions / ventilation pressure changes may include those resulting from:	• planned disruptions • changes in barometric pressure • fall of ground causing blockage and/or overpressure causing damage • fan changes/failure • ventilation control device changes/failure • outburst

	• holing into previous workings • re-circulation • ventilation circuit changes • natural ventilation pressure changes • explosions • changes in ambient temperature/humidity • fires • equipment movement • flooding of roadways • application of inertisation
Effect of re-circulation may include:	• build up of contaminant concentration (gas, fumes, dust, heat) • decrease in oxygen
Criteria for safe mine ventilation may include:	• statutory and regulatory requirements • mine ventilation management plan • measures to reduce and/or control seam gas • introduced gas • fumes and dust • temperature/humidity and maximum/minimum velocity specification • ventilation efficiency
Monitoring devices may include:	• barograph • tube bundle • real time telemetry • portable (hand held) monitoring • bag samples • gas chromatography
Monitoring includes that related to:	• atmospheric pressures • ventilation pressures and quantities • gas quality and quantity • gas composition • temperature • fire • the condition monitoring of ventilation devices
Methods of ventilation may include:	• exhaust/forcing • anistropal (antitropal) • homotropal • flank returns • ascensional/descensional • bleeder • Z/U/Y systems

	• overlapping systems • other combinations
Alarm systems and action plans may include those for:	• gas concentration/make/ratios • spontaneous combustion (physical and gaseous) • combustion indicators • condition monitoring for fans (vibration/temperature/current/failures) • ventilation devices • monitoring hardware • gas content of the coal seam
Maintenance of the ventilation system may include:	• inspection • servicing • repair

Unit Sector(s)

Coal Mining (Underground)

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.