Australian Government

Department of Education, Employment and Workplace Relations

RIIMCU403A Apply and monitor the gas management plan

Release: 1

RIIMCU403A Apply and monitor the gas management plan

Modification History

Not applicable.

Unit Descriptor

This unit covers the application and monitoring of the gas management plan in the coal industry. It includes planning and preparing for the application of the gas management plan, applying the gas management plan, and applying gas management system maintenance procedures. 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 supervisory role or as a technical specialist, 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.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan and prepare for the application of the gas management plan	1.1. Access, interpret and apply ***compliance documentation*** relevant to the work activity 1.2. Communicate and explain responsibilities and tasks in an effective and timely manner 1.3. Identify, obtain and allocate resources required for the application of the ***gas management plan*** 1.4. Identify individual ***training*** needs
2. Apply the gas management plan	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. Identify and ***interpret*** the impact of ***mine factors*** on the mines ***gas management*** 2.3. Identify, assess and apply ***hazard*** control procedures associated with gas drainage and ***outburst mining conditions*** 2.4. Apply procedures for the installation, operation and maintenance of ***mine gas*** monitoring systems 2.5. Apply procedures for the installation and operation of ***gas management devices*** and systems 2.6. Apply systems and procedures for the collection of gas samples 2.7. Record and report ***monitoring system data*** in accordance with the ***gas management plan*** 2.8. Investigate ***changes*** in ***mine atmosphere*** status and report 2.9. Interpret and apply procedures covering the relocation, operation and maintenance of drilling rigs and ***infrastructure*** according to site requirements 2.10. Respond to ***alarms*** raised in accordance with the ***gas management plan*** 2.11. Apply emergency and evacuation procedures in accordance with the ***safety management system*** 2.12. Participate in systems ***audit*** and review requirements in accordance with the

	gas management plan
3. Apply gas management system **maintenance** procedures	3.1. Carry out inspections and ensure that repair and ***maintenance*** activities are conducted in accordance with the ***gas management plan***
	3.2. Record, report and review ***maintenance*** activities in accordance 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 apply and monitor the gas management plan:

- apply legislative, organisation and site requirements and procedures for applying and monitoring the gas management plan
- access, interpret and apply technical information
- access and interpret archival and historical gas information related to the mine
- interpret and apply mathematical and scientific theorems/laws related to gas management
- collect, collate evaluate and report gas data
- conduct investigations and prepare reports
- communicate effectively in the workplace
- access, evaluate and apply data from monitoring systems and equipment
- operate hand held monitoring equipment
- identify training needs
- 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 apply and monitor the gas management plan:

- legislative and site requirements for ventilation, including air quality, air quantity, maximum/minimum values, control and distribution, flammable gas limits, ventilation fan, gas monitoring inspections and recording/reporting
- the methods of panel gas management and their application/limitations, including forcing and exhausting, homotropal and antitropal (and in conjunction with these, the use of goaf bleed or back return), auxiliary fans, coursed ventilation (narrow side/wide side), recirculation, machine mounted scrubber systems, ducted systems, compressed air venturis and bleeders
- the impact of mining techniques and mine and panel layout on panel 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
- mine gases; the types and their characteristics, sources, physiological effects and methods of detection

- mine fires; the types, sources of ignition, possible impacts on gas management
- mine explosions; the types, ignition sources and possible effects on gas management
- pressure changes; causes and the impacts on gas management
- heat/humidity; the sources and factors which may impact on gas management
- mine fans; fan types, applications and limitations
- gas control devices; the types, purposes, design criteria and specifications, distribution/placement criteria and limitations
- fixed gas monitoring systems types, uses and limitations
- portable monitoring equipment, types, uses and limitations
- computer-based systems used for mine gas analysis
- the development requirements and processes of the gas management plan
- types, characteristics, purposes and responses to alarms and trigger points/levels
- ventilation surveys, the types, frequency and method for conducting, including pressure/temperature/gas
- audit and review processes and techniques
- emergency procedures and disaster plan responses/measures
- the general use and application of ventilation theory, including
  - gas laws, including Charles and Boyle
  - natural ventilation
  - Coward's Triangle
  - Graham's Ratio
  - Ellicott's Triangle
  - gas make
  - air quantity measurement
  - control device leakage
  - duct leakage
- mine and goaf ventilation systems
- the impact of water on ventilation
- site environmental monitoring requirements
- inertisation techniques
- general purpose and application of sling psychrometer, anemometer, velometer
- the general effects of velocity pressure, duct and stopping leakage
- strata geology, including coal seam gradient, moisture content, friability, the porous features of the coal seam, stresses and intrusions, and its impact on gas drainage
- gas surveys; the types, frequency and method for conducting, including pressure/quantity/temperature and gas
- impacts of intersecting holes and hole design
- in-seam drilling techniques
- the impact of differing geological features and conditions on outburst, including faults, dykes, intrusions and strata deformities

- outburst indicators
- core sampling techniques
- training systems
- emergency response and evacuation planning processes and 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 applying and monitoring the gas management plan • implementation of requirements, procedures and techniques for the safe, effective and efficient completion of gas management plan application and monitoring • working with others to plan, prepare and conduct gas management plan application and monitoring • evidence of the consistent successful gas management plan application and monitoring
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
	• 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
	  • consistent achievement of required outcomes
	• first hand testimonial evidence of the candidate's:
	  • working with others to undertake and complete the application and monitoring of the gas management plan
	  • provision of clear and timely instruction and supervision by the individual of those involved in the conduct of the application and monitoring 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
Mine gases may be seam gases or gases from introduced sources, and may include:	• methane • carbon dioxide • oxides of nitrogen • hydrogen • carbon monoxide • sulphur dioxide • hydrogen sulphide • hydrocarbons • combinations • oxygen • nitrogen
Alarm (also known as trigger level) 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 • virgin gas content of the coal seam
Audit is the validation process to ensure the system, procedures, processes meet the established objectives and are implemented.	
Coal seam characteristics may include inherent factors such as:	• rank • petrology • moisture • particle size

	• seam gas - composition and content • pyrites • permeability ***Or depositional factors such as***: • seam thickness • multiple and rider seams • seam dip • depth of cover • cleats • friability

Changes to mine atmosphere conditions may include those resulting from:	• planned disruptions
	• changes in barometric pressure
	• fall of ground
	• 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
	• effects of re-circulation including:
	  • build up of contaminant concentration (gas, fumes, dust, heat)
	  • decrease in oxygen

Gas drainage management plan may include procedures for:	• gas drainage drilling program • gas or geological anomaly detection • mine atmosphere monitoring • stimulation techniques • installation, inspection and maintenance of goaf seals • reporting requirements • auditing • ventilation systems and usage • mine plan • action plans • systems of mining

	• response plans • emergency procedures • individual and group responsibilities • training and education procedures
Gas drainage system monitoring may include:	• continuous monitoring • leakage monitoring (laser beam technology) • portable (hand held) monitoring • collection of bag samples • identifying pipeflow and pressure requirements • ventilation measurements from relevant areas
Gas make characteristics may include:	• gas content • gas pressure • adsorption • desorption • hydrostatic pressure • strata moisture content • permeability and porosity
Gas management includes controls for gas drainage and gas outburst.	
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 • inertisation systems • monitoring devices, including: • barograph • tube bundle • real time telemetry • portable (hand held) monitoring • bag samples • gas chromatography
Ventilation devices may include:	• stoppings • overcasts • regulators • preparation seals • ventilation doors • bulk heads

	• goaf seals • final seals • pressure chambers • air locks
Gas management plan may include procedures for:	
Mine gases may include:	• mine atmosphere monitoring • reporting requirements • auditing • ventilation systems and usage • inertisation techniques • mine plan • trigger action response plans • emergency procedures • individual group responsibilities • training and education • indicators for the requirement to develop a gas drainage management plan • indicators for the requirement to develop a gas outburst management plan • criteria for mine ventilation including: • legislative requirements • mine ventilation management plan • measures to reduce and/or control seam gas • introduced gas • fumes and dust • temperature/humidity and maximum/minimum velocity specifications • ventilation efficiency • pressure and quantity
Gas management plans establish procedures for maintaining a safe environment may include:	• hazard identification and quantification • risk assessment • authority and responsibility • controls established to managed identified risks • reporting and communication • document control • audit and review
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 • blocked bore holes and standpipes • pipe pressures and flows • gas analysis • training and recording/reporting
Gas management training may apply to:	• mine workers • tradespeople • permanent employees • contractors • mine officials • other special requirements
Hazard is defined as: *a source of potential harm or a situation with a potential to cause loss* (definition from AS/NZS 4360:1999 Risk Management).	
Hazards may include:	• irrespirable atmosphere • noxious atmospheres • flammable or explosive mixtures • outburst
Installations where gas drainage **hazards** may be assessed include:	• vacuum pumps • pipes • stand pipes • gas separators and casing • surface installations • gas drainage plant including building and surface location • valves • hoses • water pumps • flame and lightning arresters • power supply to bore holes • cleaning equipment • air compressors

	• electricity and water services • pressure gauges • hydration plants
Interpret is defined as: the understanding needed by the person within their job role.	
Maintenance of the ventilation system may include:	• inspection • servicing • repair
Methods of ventilation may include:	• antitropal • homotropal • flank returns • ascensional / descensional • bleeder • Z/U/Y systems • overlapping systems • other combinations
Mine atmosphere refers to all areas in general mine ventilation district and beyond into waste working and goafs/gobs in the mine.	
Mine atmosphere monitoring may include:	• continuous monitoring • portable (hand held) monitoring • collection of bag samples • gas chromatography • ventilation measurements from all areas of the mine, including sealed areas • waste workings
Mine factors which may **impact** on gas management may include:	• mining direction • geological structures • ventilation • results of core samples • extraction rate • strata control • mining method • Geological and physical conditions of the seam and surrounding strata which may contribute to outburst potential, including: • cutters • changing cleat

	• coal colour • free gas into atmosphere • mylonite • gas content and composition • over and underlying strata (including depth, strength and type) • permeability of seam and strata • induced stresses • faults • intrusions • strata deformities
Monitoring includes that related to:	• atmospheric pressure • mine atmosphere • ventilation pressure • temperature • fire • the condition monitoring of ventilation devices • gas drainage monitoring
Monitoring system data may include:	• composition • concentration • rate of change • barometer • gas make • gas threshold levels
Procedures for **outburst mining conditions** may include :	• mine atmosphere monitoring • reporting requirements • auditing • ventilation systems and usage • pre-drilling techniques • initiation techniques • mine plan • action plans • response plans • emergency procedures • individual/group responsibilities • training and education procedures • authority to mine
Risk is defined as: *the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood*	

(definition from AS/NZS 4360:1999 Risk Management).	
Specific gas emissions may include seam gases or gases from introduced sources and may include but not be limited to:	• methane • carbon dioxide • hydrogen sulphide

Unit Sector(s)

Coal Mining (Underground)

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.