



Australian Government

Department of Education, Employment and Workplace Relations

RIIMCU603A Establish and maintain the gas drainage management plan

Release: 1

RIIMCU603A Establish and maintain the gas drainage management plan

Modification History

Not applicable.

Unit Descriptor

This unit covers the establishment and maintenance of the gas drainage management plan in the coal industry. It includes: identifying, analysing and evaluating gas drainage hazards, risks and needs, identifying, analysing and evaluating gas drainage control options and measures, designing and developing gas drainage management systems, establishing the gas drainage management plan, planning and preparing for the implementation of the gas drainage management plan, and establishing the process to audit the effectiveness of the gas drainage management system. 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. Identify, analyse and evaluate gas drainage hazards, risks and needs	1.1. Identify, evaluate and clarify coal seam characteristics and conditions which could lead to a requirement for gas drainage 1.2. Identify and clarify the effects of gas drainage on mine atmosphere 1.3. Identify the requirements for ventilation in relation to gas drainage 1.4. Identify and clarify the impacts of water accumulation on gas drainage
2. Identify, analyse and evaluate gas drainage control options and measures	2.1. Identify and evaluate the types and advantages/disadvantages of gas drainage methods 2.2. Identify and evaluate hazards relating to gas drainage 2.3. Identify and evaluate the method, purpose and procedures for installation and use of mine monitoring systems with regards to gas drainage 2.4. Identify methods to maximise the effectiveness of a gas drainage program
3. Design and develop gas drainage management systems	3.1. Access, interpret and clarify the legislative, and site requirements related to gas drainage systems 3.2. Design and develop gas drainage systems to satisfy the operational conditions of the mine 3.3. Design and develop the surface and underground infrastructure to minimise the risk of hazards in relation to gas drainage 3.4. Design and develop monitoring and controls systems for the gas drainage management system
4. Establish the gas drainage management plan	4.1. Develop and establish hazard control procedures associated with gas drainage 4.2. Establish action levels to minimise the hazards of gas drainage 4.3. Develop and establish gas monitoring system installation, operation and maintenance procedures 4.4. Develop and establish gas drainage system

	installation, operation and recovery procedures 4.5. Develop and establish gas drainage system maintenance requirement procedures 4.6. Develop and establish gas drainage system information recording and reporting procedures 4.7. Establish training requirements for the gas drainage management system
5. Plan and prepare for the implementation of the gas drainage management plan	5.1. Access, interpret and apply compliance documentation relevant to the work activity 5.2. Identify, clarify and communicate to all personnel roles and responsibilities, as specified in the gas drainage management plan 5.3. Identify, forecast, obtain and allocate/schedule resources required for the implementation of the gas drainage management plan 5.4. Implement the gas drainage management training program 5.5. Encourage, receive, review and, where appropriate, implement suggestions and recommendations for changes to the gas drainage management plan
6. Establish the process to audit the effectiveness of the gas drainage management system	6.1. Audit gas drainage monitoring systems in accordance with legislative and site requirements 6.2. Audit gas drainage control devices in accordance with legislative and site requirements 6.3. Audit recording systems in accordance with the gas drainage management plan 6.4. Audit gas drainage installation, operation, maintenance and recovery procedures 6.5. Audit the gas drainage management training plan for currency, relevance and compliance with the requirements of the gas drainage management system 6.6. Establish procedures for response to instances of non-compliance or other discrepancies/deficiencies revealed by audit

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 establish and maintain the gas drainage management plan:

- apply legislative, organisation and site requirements and procedures for establishing and maintaining the gas drainage management plan
- access, interpret and apply technical information
- access and analyse archival and historical gas information related to the mine
- interpret and apply mathematical and scientific theorems / laws related to gas drainage
- access, interpret and apply geological reports
- perform gas drainage planning mathematical calculations
- access, evaluate and apply design criteria for gas drainage systems and devices
- interpret computer spreadsheets and modelling / simulations
- collect, collate and evaluate gas drainage data
- establish technical procedures relating to gas drainage
- conduct enquiries/investigations and prepare reports
- access, evaluate and apply data from monitoring systems and equipment
- operate hand held monitoring equipment
- 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 establish and maintain the gas drainage management system:

- legislative and site requirements which may include those for gas drainage drilling, gas drainage installation and recovery, ventilation requirements, return airways gas levels, intake airway gas accumulated levels, gas control and distribution, environmental management, local government requirements, inspections and reporting
- 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 impact of gas drainage on mining techniques, mine and panel design and production output
- the impact of the strata geology and coal seam characteristics on the gas drainage management plan, including coal seam gradient, moisture content, friability,

- permeability, gas content, gas composition, the porous features of the coal seam, stresses and intrusions
- outburst mining monitoring procedures
 - drilling options and related equipment and techniques, including directional drilling techniques
 - hazard management processes and techniques
 - content, composition and pressure
 - the effects of the gas in the coal seam
 - the effects of gas characteristics from roof
 - the impacts of accumulation of coal dust after gas drainage has been completed
 - pressure changes; causes, the impacts on the ventilation system, and the effects on gas drainage
 - heat/humidity; the sources and factors which may impact on gas drainage and personnel
 - mine fans; fan laws, fan types, performance characteristics, configurations, applications and limitations in association with the gas drainage management plan
 - ventilation control devices; the types, purposes, design criteria and specifications, distribution / placement criteria and limitations in association with the gas drainage management plan
 - ventilation 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, sales, hurdles, bleeders and purging
 - fixed gas drainage monitoring systems types, characteristics, uses and limitations
 - portable monitoring equipment for gas drainage purposes, types, characteristics, uses and limitations
 - functions, capabilities, advantages, limitations and uses of gas drainage computer modelling and simulation techniques
 - use of computer-based systems for mine environment and gas drainage analysis
 - gas drainage management plan development requirements and processes
 - gas drainage surveys; the types, frequency and method for conducting including pressure/quantity/temperature and gas
 - processes and techniques for determining alarms and trigger points / levels
 - audit and review processes and techniques
 - site control documentation requirements
 - emergency response and evacuation procedures
 - general uses and applications of ventilation theory, including:
 - Atkinson's equation
 - methods of determining frictional resistance
 - gas laws, including Charles and Boyle
 - natural ventilation pressures
 - gas make
 - leakage

- determination of mine resistance curves
- regulator and equivalent orifice calculation
- determination of fan operating / duty points
- Kirchoff's laws
- mine operational procedures
- strata control systems and their effects on gas drainage
- mine and goaf ventilation systems
- underground water management principles and systems
- impacts of intersecting and intersected holes and hole design
- site environmental monitoring requirements
- legislative and mine reporting procedures

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 establishing and maintaining the gas drainage management plan • implementation of procedures and techniques for the safe, effective and efficient establishment and maintenance of the gas drainage 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 drainage techniques that best meet the required outcomes • working with others to undertake and complete the establishment and maintenance of the gas drainage management plan • consistent successful establishment and maintenance of the gas drainage 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 establishment and maintenance of the gas drainage 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 drainage techniques that best meet the required outcomes • consistent achievement of required outcomes • first hand testimonial evidence of the candidate's: • working with others to undertake and

	complete the establishment and maintenance of the gas drainage management plan • provision of clear and timely required support and advice on the establishment and maintenance of the gas drainage 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
Coal seam characteristics may include:	• inherent factors such as rank • petrology • moisture • particle size • seam gas make • pyrites <i>Or depositional factors such as:</i> • seam thickness • multi seams • seam dip • depth of cover • cleats friability • interaction of other coal seams and gas makes • clay bands within the coal seam and molorite zones
Mine atmosphere refers to the atmosphere in all areas in the general mine ventilation district and beyond into waste working and goafs in the mine.	
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 • outbursts • induced outburst • gas under pressure • location of drainage pipes • static electricity • gas leakage from and into gas pipelines
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).	
Action (alarm or trigger) level is a generic term used to describe a level determined at the mine site at which 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).	
Gas drainage management plans establish procedures for maintaining a safe environment including:	• hazard identification and quantification • risk assessment • authority and responsibility • controls established to manage identified risks • reporting and communication • document control
Gas drainage management plan may include:	• procedures for gas drainage drilling program • gas or geological anomaly detection • mine atmosphere monitoring • stimulation techniques • goaf seals

	• reporting requirements • auditing • ventilation systems and usage • mine plan • action plan • systems of mining • response plans • emergency procedures • individual and group responsibilities • training and education procedures
Principles of mine design may include:	• recovery • reserve optimisation • mining direction • geological structures • ventilation • strata control • mining method • productivity • environmental considerations and access
Standard operating procedures (SOP) are also known as safe working procedures, safe operating procedures and standard working procedures.	
Mine gases may be seam gases or gases from introduced sources and may include but not be limited to:	• methane • carbon dioxide • carbon monoxide • oxides of nitrogen • hydrogen • sulphur dioxide • hydrogen sulphide • hydrocarbons
Ventilation systems may include the use of:	• main mine fan • auxiliary fans • brattice • regulators • seals • stoppings • overcasts • ventilation doors • surface drainage boreholes

	• pressure chambers
Geological conditions may include:	• faults • dykes • intrusions • strata deformities • induced stresses • depth of overlaying strata • strength of immediate strata • under and over the coal seam • mining lease gas make
Gas make characteristics may include:	• gas content • gas pressure • absorption • desorption • hydrostatic pressure • strata moisture content • permeability and porosity • tectonic stress
Gas drainage monitoring may include:	• continuous monitoring • leakage monitoring (laser beam technology) • portable (hand held) monitoring • collection of bag samples • pipeflow and pressure measurements • gas chromatography • ventilation measurements from relevant areas
Gas drainage infrastructure may include:	• vacuum pumps • pipes • boreholes and stand pipes • gas separators and casing • surface installations • gas drainage plant, including building • valves • hoses • water pumps • flame and lighting arresters • power supply to bore holes • cleaning equipment • air compressors • electricity and water services • pressure gauges and hydration plants
Gas management training	• mine workers

applies to:	• tradespeople • permanent employees • contractor • mine officials • other special requirements
Alarm systems and action plans may include those for:	• gas concentration/make • combustion indicators • condition monitoring for fans (vibration/temperature/current failures) • ventilation devices • monitoring hardware • temperature alarms
Procedures required to support the gas drainage management plan may include those for:	• construction • action response • permit to work • condition monitoring • auditing • maintenance • document control • atmosphere monitoring • ventilation system control • communication systems • survey procedures • standard operating procedures • changes • training and recording/reporting
Maintenance of the gas drainage system may include inspection, servicing and repair.	

Unit Sector(s)

Coal Mining (Underground)

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.