



Australian Government

Department of Education, Employment and Workplace Relations

RIIUND601A Establish and maintain the ventilation management system

Release: 1

RIIUND601A Establish and maintain the ventilation management system

Modification History

Not applicable.

Unit Descriptor

This unit covers the establishment and maintenance of the ventilation management system in the resources and infrastructure industries. It includes identifying, analysing and evaluating hazards associated with the mine atmosphere, events which impact on ventilation and mine ventilation control options and measures. It also includes design and development of the ventilation management system, establishment of the ventilation management plan, planning and preparing for the implementation of the plan, and auditing and reviewing the plan. 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
- Metalliferous 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 hazards associated with mine atmosphere	1.1. Access, interpret and apply compliance documentation relevant to the work activity 1.2. Identify and evaluate the sources and hazards of dust, gases and fumes 1.3. Identify, analyse and evaluate the likely impact of gas drainage 1.4. Identify, analyse and evaluate the hazards of spontaneous combustion, fire and explosion 1.5. Identify, analyse and evaluate the impact of ventilation pressure differentials 1.6. Identify, analyse and evaluate the effect of changes in air temperature, pressure and humidity
2. Identify, analyse and evaluate events which impact on ventilation	2.1. Identify and evaluate the impact of disruption to the ventilation system 2.2. Identify and evaluate the causes and effects of re-circulation 2.3. Identify, analyse and evaluate the potential for and likely impact of windblast 2.4. Identify, analyse and evaluate the potential for and likely impact of outburst 2.5. Identify, analyse and evaluate the impacts of holing into previous workings 2.6. Identify, analyse and evaluate the impact of water 2.7. Identify, analyse and evaluate the potential for, and likely impact of spontaneous combustion, fires and explosion
3. Identify, analyse and evaluate mine ventilation control options and measures	3.1. Identify, analyse and evaluate the types, applications and limitations of the ventilation control devices 3.2. Identify and evaluate the impact of mine design on the ventilation system 3.3. Identify and evaluate the methods, purposes and limitations of mine monitoring systems and processes
4. Design and develop the ventilation management system	4.1. Access, interpret and clarify the legislative and site requirements related to ventilation management

	4.2. Incorporate the principles and requirements of mine ventilation including the effects of mine gases into the design and development of the ventilation system 4.3. Identify design criteria and specification for ventilation networks and incorporate into the design and development of the mine ventilation system 4.4. Identify, evaluate and incorporate the requirement for mine fans into the design and development of the ventilation system 4.5. Evaluate ventilation control device options against requirements and incorporate into the design and development of the ventilation system 4.6. Incorporate ventilation and environmental monitoring systems into the design and development of the ventilation system
5. Establish the ventilation management plan	5.1. Establish and incorporate mine ventilation objectives, systems descriptions and responsibilities into the ventilation management plan 5.2. Establish procedures for the installation, operation and maintenance of ventilation monitoring systems in the ventilation management plan 5.3. Prepare and establish procedures for the installation, operation and changes to ventilation control devices in the ventilation management plan 5.4. Determine trigger levels for each hazard and incorporate into the ventilation management plan 5.5. Establish a ventilation system maintenance program and procedures and incorporate into the ventilation management plan 5.6. Incorporate audit, review and update procedures for the ventilation systems into the ventilation management plan 5.7. Establish a program including systems and procedures to satisfy identified ventilation management training requirements 5.8. Establish a procedure for planning, controlling, implementing, recording and communicating changes to mine ventilation

	systems and components and incorporate into the ventilation management plan
6. Plan and prepare for the implementation of the ventilation management plan	6.1. Identify and interpret the legislative and site requirements related to the ventilation management plan 6.2. Access and interpret the ventilation management plan 6.3. Identify, clarify and communicate to all personnel roles and responsibilities as specified in the ventilation management plan 6.4. Identify, forecast, obtain and allocate/schedule resources required for the implementation of the ventilation management plan 6.5. Implement the ventilation management training program 6.6. Encourage, receive, review and, where appropriate, implement suggestions and recommendations for changes to ventilation management implementation procedures
7. Audit and review the ventilation management plan	7.1. Audit ventilation standards for compliance with relevant legislative and ventilation management plan specifications 7.2. Audit ventilation control devices for compliance with relevant legislative and ventilation management plan requirements 7.3. Audit monitoring systems for compliance with relevant legislative and ventilation management plan standards 7.4. Audit ventilation recording systems for compliance with the ventilation management plan 7.5. Audit ventilation system maintenance program and procedures for compliance with the ventilation management plan 7.6. Audit the ventilation management training program for currency, relevance and compliance with the requirements of the ventilation management plan 7.7. Audit and review the planning process of future ventilation requirements 7.8. Identify and correct non-compliance or other discrepancies/deficiencies revealed by

	audit
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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 ventilation management system:

- apply legislative, organisation and site requirements and procedures for establishment and maintenance of the ventilation management system
- access, interpret and apply technical information
- access and analyse archival and historical ventilation information related to the mine
- interpret and apply mathematical and scientific theorems/laws related to ventilation
- perform ventilation planning mathematical calculations
- access, evaluate and apply design criteria for ventilation systems and devices
- interpret computer spreadsheets and ventilation modelling/simulations
- collect, collate and evaluate ventilation data
- establish technical procedures relating to ventilation
- conduct enquiries/investigations and prepare reports
- communicate effectively in the workplace
- access, evaluate and apply data from monitoring systems and equipment
- operate hand held monitoring equipment
- establish ventilation training requirement, 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 establish and maintain the ventilation management system:

- legislative and site requirements for ventilation including air quality, maximum and minimum values, control and distribution, flammable gas and dust limits, ventilation fans, gas monitoring, respirable dust limits and inspections and recording/reporting
- methods of mine ventilation and their applications/limitations including exhaust/force, antitropical, homotropical, flank returns, ascensional/descensional, bleeder, ZUY systems and other combinations
- methods of panel ventilation and their applications/limitations including homotropical and antritropical auxiliary fans, coursed ventilation (narrow side/wide side), machine mounted scrubber systems, compressed air venturis and bleeders
- impact of mining techniques and mine and panel design on ventilation

- impact of coal characteristics and coal seam gradients on mine ventilation design
- principles and impacts of the ventilation system of gas drainage, spontaneous combustion, outburst and windblast
- mine gases; the types and their characteristics under varying circumstances, sources, physiological effects and methods of detection
- dust, fumes and other particulate matter; the types, sources, physical and physiological effect, and control/mitigation methods
- mine fires; the types, sources of ignition, possible effects on the ventilation circuit and prevention/control/mitigation methods
- mine explosions; types, ignition sources, possible effects on the ventilation circuit and prevention/control/mitigation methods
- pressure changes; causes, the impacts on the ventilation system, and responses (to include the causes and effects of natural ventilation and recirculation)
- heat/humidity; the sources and factors which may impact ventilation and personnel
- mine roadways and shafts; their design parameters and impact of mine ventilation
- mine fans; fan laws, fan types, performance characteristics, configurations, applications and limitations
- 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, sails, hurdles and bleeders
- ventilation networks and individual circuit design criteria, specifications and design processes
- fixed ventilation monitoring systems types, characteristics, uses and limitations
- portable monitoring equipment, types, characteristics, uses and limitations
- functions, capabilities, advantages, limitation and uses of computer modelling and simulation techniques
- computer-based systems for mine environmental analysis
- ventilation management plan development requirements and processes
- ventilation surveys; the types, frequency and method for conducting including pressure/quantity/temperature and gas/dust
- processes and techniques for determining alarms and trigger points/levels
- audit and review processes and techniques
- emergency response and disaster planning processes and techniques
- general uses and application of ventilation theory, including: Atkinson's equation, methods of determining frictional resistance, frictional resistance values for mine airways and ducts, psychrometry and heat, gas laws including universal gas law, natural ventilation pressures, static/velocity/total pressures and shock loss, control device leakage, duct leakage, determination of mine resistance curves, combining system resistance and fan curves, regulator and equivalent orifice calculation, determination of fan operating/duty points and Kirchoff's laws

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 ventilation management system • implementation of procedures and techniques for the safe, effective and efficient establishment and maintenance of the ventilation management system • the identification of the relevant information and scope of the work required to meet the required outcomes • the identification of viable options for establishment and maintenance of the ventilation management system that best meet the required outcomes • working with others to undertake and complete the establishment and maintenance of the ventilation management system • consistent successful establishment and maintenance of the ventilation management system
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 should 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 the establishment and maintenance of the ventilation management system • observed, documented and/or first hand testimonial evidence of the candidate's: • implementation of appropriate requirements, 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 and selection of viable options for the establishment and maintenance of the ventilation management system 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 ventilation management system • provision of clear and timely required support and advice on the establishment and maintenance of the ventilation management system
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, organisation and site requirements and procedures • manufacturer's guidelines and specifications • Australian standards • Employment and workplace relations legislation • Equal Employment Opportunity and Disability Discrimination legislation
Hazards of spontaneous combustion, fires and explosion may include:	• noxious and flammable gases • heat • contaminants • altered ventilation pressures/flows • direct physical impacts and weakening of the strata • complete disruption to the ventilation system
Temperature, pressure and humidity may be impacted by:	• climate conditions • ventilation quantities • location of workplaces • mine layout and design • location of mine entries • depth • adjacent strata type • number and types of machinery • seam gas composition under varying temperatures and pressures
Ventilation system may include:	• waste and sealed areas and all surface and underground fans and ventilation devices which control or impact on the mine ventilation
Effects of re-circulation may include:	• a build up of contaminant concentration (gas, fumes, dust, heat) and a decrease in oxygen
Water may:	• impact on the mine ventilation management plan through: • liberation of dissolved gases

	• capture of soluble gases and fumes • gas drainage efficiency • seam moisture infusion or drainage • dust liberation and suppression • large ingresses disrupting ventilation networks • ventilation requirements for pumping stations • influence on spontaneous combustion propensity • humidity and hydrostatic pressure
Fires may include:	• solid • liquid • gas • metals
Ventilation control devices may include:	• doors • regulators • seals • stoppings • air crossings • bulk heads • goaf seals and pressure chambers • air locks • fans
Impact of mine design on the ventilation system may include:	• surface access • mining method/rate • barrier pillars and segregation of roadways • system of mining • bleeder or back returns • number of headings • bleeders • geological features
Mine gases may include:	• gases from other introduced sources such as: • methane • carbon dioxide • carbon monoxide • oxides of nitrogen • hydrogen • sulphur dioxide • hydrogen sulphide • hydrocarbons

	• contaminations • oxygen • nitrogen
Ventilation management plans establish procedures for maintaining optimum mine ventilation including:	• mine hazard identification and quantification • emergency and evacuation procedures • risk assessment • authority and responsibility • controls established to manage identified risks • reporting and communication • document control • audit and review
Maintenance of the ventilation monitoring system may include:	• inspection • servicing • repair
Ventilation management training applies to:	• mine workers • tradespeople • permanent employees • contractors • mine officials • other specific requirements

Unit Sector(s)

Underground Mining

Competency field

Refer to Unit Sector(s).

Co-requisite units

Not applicable.