

Undermanager of underground coal mines certificate of competence

Written examination held 27 & 28 September 2018

Legislation:

Unless otherwise stated all references to Act and Regulations are to:

Work Health and Safety Act 2011

Work Health and Safety Regulation 2017

Work Health and Safety (Mines and Petroleum Sites) Act 2013

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

Examinations are held in the following regions:

Northern region

Southern region

UBI - Mining legislation

Question 1

An operator of an underground coal mine has a number of legislative requirements under the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014 with respect to operating diesel equipment underground. What are these requirements and associated limitations? (20 marks)

Question 2

- a) The Work Health and Safety (Mines & Petroleum Sites) Regulation 2014 states a mine operator has a number of requirements that must be met for emergency exits from underground mines. What are these? (12 marks)
- b) In addition to the establishment of emergency exits, the same clause states that the operator of an underground mine must ensure other matters. What are these four requirements? (8 marks)

Question 3

Clause 104 of the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014 requires the operator to provide information, training and instruction to workers.

- a) What are the requirements of this clause? (16 marks)

- b) For the purpose of this clause, what are the requirements for the provision of risk management techniques? (4 marks)

Question 4

Section 15 of the Work Health and Safety (Mines and Petroleum Sites) Act 2013 requires the operator to notify the regulator of notifiable incidents.

- a) What are the requirements of this section? (15 marks)
b) For the purposes of this section, what is a notifiable incident? (5 marks)

Question 5

You have been employed to be the undermanager of what will be a new underground mine.

The project has just started and the management team is developing a full set of management systems. You have been asked to develop the risk management arrangements including establishment of the standard for “Review of controls measures” in accordance with the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014.

Explain the necessary arrangements and legislative considerations required to be put in place at this mine for “Review of control measures”. (20 marks)

UB2 - Mine ventilation

Question 1

Jacobs’s Creek Colliery workings are shown on the attached plan.

The colliery mines a working section that combines the upper section of the “Williewarrina” seam, a 300 mm sandstone /shale band, and the lower section of the “Wonga” seam, both seams have a medium propensity to spontaneous combustion.

To address geotech, coal product specification and mining equipment restraints, mining height is 3.5 metres, leaving 0.60 metres of top coal, overlaid by 2 metres of shale and 8 metres of mudstone and 0.5 metres of coal on the floor.

The immediate strata below the “Williewarrina” seam, is a thick, reasonably competent bed of sandstone. There is a thick, poor quality coal seam in the overlying strata.

The Jacob’s Creek Colliery workings are accessed via one transport drift and two belt drifts from the pit top, which is at the foot of a hillside. There is also one 5.5 metre diameter 120 metres deep, concrete lined upcast ventilation shaft.

The combination of the “Williewarrina” and “Wonga” seams is moderately gassy with moderate permeability. Total insitu-seam gas content is typically 5 m³/t, with a CO₂:CH₄ ratio of 20:80. Approximately 40% of the insitu gas is liberated during the production process.

The depth of cover for the working seam ranges from 120 metres adjacent to pit bottom to 340 metres in the eastern parts of the lease. A considerable number of low displacement faulted zones exist across the lease.

With improving coking coal prices, the mine is developing both the 900 and 800 districts in parallel with the expectation that the mine will operate two longwall faces in the future.

Currently the mine produces coking coal from one longwall panel (longwall 920) supported by three development panels; 930 maingate panel, the new 800 maingate panel, (both super units) and 800 district mains development (single CM unit)

The mine produces approximately 4.0 million tonnes per year.

The mine has recently experienced its first known incident of a heating in the Williewarrina/Wonga seams, in the active goaf of LW920. The concern now is that the mine layout was not designed with the risk of spontaneous combustion in mind.

On the accompanying plan:

- a) Show the location of all the production faces, together with an estimate of their daily production levels. (10 marks)
- b) Taking into consideration the hazards you have identified for this mine layout and information provided, ventilate the plan using the code of symbols specified in the *Australian Standard AS4368-1996 Mine Plans – Preparation and Symbols*. (30 marks)
- c) Document the air quantities you would expect to be entering each production panel measured at the commencement of the hazardous zone. Provide an explanation of why these quantities have been chosen. (10 marks)
- d) Provide suggestions on what appropriate measures could be adopted to deal with the suspected heating in the LW920 goaf. (25 marks)
- e) Based on your assumptions and the information provided, calculate the general body methane content in the LW920 panel return during production shifts. Clearly state the assumptions you are relying upon in these calculations and why you have chosen these assumptions. (15 marks)
- f) Calculate the main ventilation fan power requirements to ventilate this mine. Clearly state the assumptions you are relying upon in these calculations and why you have chosen these assumptions. (10 marks)

Question 2

Using the information supplied in Question 1 and in relation to the mine design/layout as per the attached plan, identify all the relevant hazards and difficulty associated with the ventilation of this mine. Provide an explanation of how these hazards will be controlled. Your answer should include ventilation arrangements, and any other identified major hazard management requirements associated with the ventilation. (40 marks)

Considering the close scrutiny on monitoring for spontaneous combustion at Jacob's Creek Colliery an appreciation of the TARPs is required. Complete the triggers table below with the details you expect to be included in the spontaneous combustion longwall TARP. (30 marks)

- a) Considering the current stage of development for this mine, discuss potential mine layout options to address hazards associated with spontaneous combustion in future workings and why those methods would be appropriate. (15 marks)
- b) Describe the monitoring arrangements you would expect to be implemented at Jacob's Creek Colliery, where you would expect to position the monitoring and why you choose those arrangements (15 marks)
- c) Considering the current stage of development for this mine, discuss potential mine layout options to address hazards associated with spontaneous combustion in future workings and why those methods would be appropriate. (15 marks)
- d) Describe the monitoring arrangements you would expect to be implemented at Jacobs Creek Colliery, where you would expect to position the monitoring and why you choose those arrangements (15 marks)

Figure 1. Triggers table

TRIGGER	Normal	Level 1 <i>(any one of the following indicators unless specified)</i>	Level 2 <i>(any one of the following indicators unless specified)</i>	Level 3 <i>(any one of the following indicators unless specified)</i>	Level 4 <i>(as specified AND a flammable gas mix in affected area)</i>
Longwall – General Body Return <i>(normal coal)</i>	CO make <= 10 L/min CO goaf stream < 5ppm				As per Level 3 indicator AND Flammable mix in affected area
Active Goaf <i>(Seal sample)</i>	CO < 50ppm GR < 0.2				
RESPONSE	Normal	Level 1	Level 2	Level 3	Level 4
Control Room Operator	Process bag samples as required	Review trends of alarm Notify Undermanager	Review trends of alarm Notify Undermanager	Review trends of alarm Notify Undermanager Notify Ventilation Officer	Review trends of alarm Notify Undermanager Notify Ventilation Officer Advise persons to withdraw from the mine
Shift Undermanager					

UB3 - Coal mining practice

Question 1

You are the nightshift undermanager at a longwall mining operation.

The longwall face is 300 metres long and the seam extracted is 4 metres high. The seam is slightly gassy and there have been a number of frictional ignitions at the mine.

You receive a call from control to advise that while an operator has been performing frictional ignition checks on the maingate drum, he has been struck by falling coal and has sustained a suspected spinal injury.

- a) Describe your immediate actions to recover this situation? (10 marks)
- b) You have been made responsible for the event investigation.
What measures would you implement to prevent a reoccurrence? (10 marks)

Question 2

You are the nightshift undermanager at a longwall mine that is experiencing tailgate horizon problems.

You have received a call from the longwall deputy. They advised you that the tailgate pans for the last 10 powered roof supports are now 600 mm above the true floor horizon and the last tailgate powered roof support has rolled off the 600 mm canch, has broken its anti-topple sling and is now leaning against a tailgate support can.

The separation between the last two supports is now over 1 metre with a significant amount of goaf flushing between the two supports.

- a) Describe your immediate actions to recover this situation? (6 marks)
- b) Outline the process that you would follow to investigate how this has occurred? (7 marks)
- c) What controls would you put in place to safely recommence production? (7 marks)

Question 3

You are the weekend dayshift undermanager when you receive a call that there has been a fall of ground onto a continuous miner that was cutting a breakaway.

A piece of rib, approximately 3 metres long, has broken away and fallen on the LHS rib protector, damaging the protector. Two operators were standing on the platform adjacent to the rib protector. They are both shaken but uninjured.

- a) Describe your immediate actions to recover this situation? (6 marks)
- b) You have been tasked with investigating the incident and recommending additional controls to prevent a reoccurrence of this incident.
Detail how you carry out the investigation, what you believe the additional controls would be and how you would implement them? (14 marks)

Question 4

You are the undermanager of a longwall mine on Monday night shift and you receive a phone call from the control room officer while you are at the longwall panel.

The control room officer informs you an incident has occurred 10 minutes ago in the gateroad development panel.

You are advised that a shuttle car has lost control on a steeply dipping cut-through while wheeling from the continuous miner to the bootend.

The operator has steered the shuttle car into the rib line and is reported as shaken but uninjured.

- a) Outline the immediate actions you would take and instructions you would issue? (8 marks)
- b) Explain the steps you would take to minimise the potential for ongoing risk? (4 marks)
- c) List the people that you consider would need to be informed of the incident for the purposes of statutory and/or consultation purposes? (4 marks)
- d) Outline the process you would adopt on shift to investigate the incident? (4 marks)

Question 5

You are a shift undermanager of a moderately gassy longwall mine that has a history of being susceptible to frictional ignitions of methane during development operations.

- a) Provide details of factors that may result in increased risk of frictional ignition including environmental and operational factors? (6 marks)
- b) List risk management controls for minimisation of the frictional ignition risk including their hierarchy of control? (6 marks)
- c) Outline the responsibilities of your role as the shift undermanager in the management of the frictional ignition risk at the mine? (4 marks)
- d) In the event you are notified of a frictional ignition occurring at the face of a continuous miner development panel while you are on duty as the shift undermanager, outline the immediate actions you would take? (4 marks)

Question 6

- a) Explain the main differences between a coal burst and an outburst? Include details on the mechanisms causing each event. (3 marks)
- b) List factors including geological, mine design and other factors which affect the propensity for coal bursts? (6 marks)
- c) List measures that can be applied in assessing and monitoring for the level of coal burst risk? (5 marks)
- d) List management controls for minimising coal burst risk? (6 marks)

Question 7

- a) Explain the process of spontaneous combustion in an active longwall goaf, and how/ when can this result in a heating? (7 marks)
- b) What are the likely indicators of spontaneous combustion in longwall and how would you apply these indicators as a shift undermanager? (5 marks)
- c) What are the principle means to mitigate a heating in the goaf from occurring? (5 marks)
- d) What are three techniques available to combat an active heating in a goaf? (3 marks)

Question 8

- a) What are the physical and physiological effects of carbon monoxide? How does carbon monoxide effect an operator in underground operations? (5 marks)
- b) Describe the effects of carbon monoxide poisoning / exposure? How do you treat exposure to carbon monoxide? (5 marks)
- c) What are the common sources of carbon monoxide and as an undermanager, how do you monitor exposure of your operators to CO? (5 marks)
- d) Briefly describe the way a self-contained self-rescuer works, and a filter self-rescuer works? (5 marks)

More information

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Acknowledgments

Undermanager of underground coal mines examination panel

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