

EXAMINATION PAPER

Undermanager of underground coal mines certificate of competence

UB1 - Coal mining legislation

Written examinations held 15 October 2019

Instructions to candidates

All five (5) questions are to be attempted.

All questions are of equal value - 20 marks each

10 minutes reading time is allowed prior to the start of the examination

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

- 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
- Explosives Act 2003
- Explosives Regulation 2013

Question 1

You are an undermanager in charge of weekend night shift and a gateroad development panel deputy reports to you that he has discovered the belt road of the gateroad has been driven off centre for the past 25 metres. The belt road is 5.4 metres wide and the roadway has been driven a maximum of 1.0 metres off centre.

To facilitate later longwall extraction, the roadway will need to be widened prior to the next belt extension to a maximum 6.4 metres along the 25m length of roadway such that the rib line meets original design specification.

In respect of the above information, 4 marks each will be awarded for answering the following points:

- a) What is required to ensure statutory compliance?
- b) What action is required to be done prior to widening the roadway?
- c) How soon after completing this action can the roadway be widened?
- d) What information is required to support the action?
- e) What steps could be taken to shorten the period before the widening could commence?

Question 2

A Principal hazard management plan is required to be developed for mine shafts and winding systems.

- a) List the five (5) controls outlined within Schedule 1 (3) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 to be considered in respect of managing the risks of the potential for failure or damage to equipment and control measures? These controls are engineering controls. (10 marks)
- b) As an undermanager in charge of a shift, what are your responsibilities in respect of reporting and communication at the start and end of shift as prescribed in Clause 27 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. Indicate the required content of the reports. (10 marks)

Answers are to include your obligations in respect of acknowledging reports, and the undertaking of communication of matters.

Question 3

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

- a) What are the requirements of this clause? (15 Marks)
- b) For the purpose of this clause, what are the requirements for the provision of risk management techniques? (5 Marks)

Question 4

Section 15 of the Work Health and Safety (Mines and Petroleum Sites) Act 2013 No 54 requires the operator to notify the Regulator of notifiable incidents.

- a) What are the requirements of this section? (10 marks)
- b) For the purposes of this section, what is a notifiable incident? (10 marks)

Question 5

An operator of an underground coal mine has a number of legislative requirements under Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 with respect to operating diesel equipment underground.

What are these requirements and associated limitations? (20 marks)

UB2 - Coal mine ventilation

Written examinations held 15 October 2019

Instructions to candidates

All questions are to be attempted.

Question 1 and 2 are of equal value - 100 marks each.

10 minutes reading time is allowed prior to the start of the examination.

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

- 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

- Explosives Act 2003
- Explosives Regulation 2013

Question 1

DONALD Colliery workings are shown on the attached plan.

The colliery works the “TRUMP” seam which has not been mined with underground mining before, this has a low to medium propensity to spontaneous combustion, is 3.0 metres thick and is overlaid by 6 metres of shale and sandstone. The working section is the lower 2.6 metres of the “TRUMP” seam thickness.

The immediate strata below the “TRUMP” seam, is a 2.5 metres thick reasonably competent bed of sandstone. There are a number of thin coal seams in the overlying strata and also below the seam.

The Colliery workings are accessed via three short portal drivages from an existing open cut highwall. One of the three portals has the main ventilation fan.

The “TRUMP” seam is moderately gassy with a moderate permeability. Total in situ-seam gas content is typically 10 m³/t, with a CO₂:CH₄ ratio of 80:20. Approximately 60% of the insitu gas in the cut coal is liberated during the production process.

Due to the undulating surface contours the depth of cover for the “TRUMP” seam ranges from 50 metres to 350 metres. A considerable number of low displacement faulted zones exist across the lease.

Typical roof support is 6 x 2.1 metre bolts and a 1 metre x 4.8 metre mesh module per metre. Ribs are friable and prone to failure in the upper section of the rib due to 50mm clay band in the upper section of the seam, requiring support with mesh and 2 x 1.2 metre point anchor bolts every metre.

The mine produces low grade thermal coal from two Continuous Miners in development units seven days per week and a longwall panel (LW1) five days per week. The mine has a business plan to produce 3.5 million tonnes per year. The two Continuous Miners are advancing the next Main Gate roadway. The first Longwall block LW1 is about to be commenced.

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) Ventilate the plan using the code of symbols specified in the Australian Standard AS4368-1996 Mine Plans – Preparation and Symbols. (35 marks)

- c) Document the air quantities you would expect to be entering each production panel measured at the commencement of the hazardous zone. Indicate why these quantities have been chosen. (10 marks)
- d) Based on your assumptions and the data provided calculate the general body methane and carbon dioxide content in the LW1 panel return whilst the LW is producing coal.
Clearly state assumptions you are relying upon in these calculations and why you have chosen these assumptions. (20 marks)
- e) Calculate the main ventilation fan power requirements to ventilate this mine.
Clearly state assumptions you are relying upon in these calculations and why you have chosen these assumptions. (25 marks)

Question 2

Using the data supplied in Question 1 and in relation to the mine design / layout as per the attached plan for DONALD Colliery:

- a) Identify and list the relevant hazards associated with the ventilation of this mine with these conditions, given it is the first time a Longwall has mined this seam.
Your answer should include ventilation arrangements, and any other identified major hazard management requirements associated with the ventilation. (30 marks)
- b) Describe the process of assessing the Hazards you have identified for DONALD Colliery and, how control methods would be determined? (15 marks)
- c) Discuss the primary methods you would expect to be implemented at the DONALD Colliery for the management of the virgin gas content present and, why those methods are appropriate? (10 marks)
- d) What spontaneous combustion management hazards have you identified for DONALD Colliery? (10 marks)
- e) Describe monitoring arrangements you would expect to be implemented at DONALD Colliery, where you would expect to position the monitoring and, why you chose these arrangements? (5 marks)
- f) With the monitoring arrangements for the operating Longwall, quantify the gas alarm levels you would expect for Carbon Monoxide for the active Tailgate return for the ventilation quantity that you have given in Question 1(c).

Show your calculation and assumptions you would expect for a low Level alarm and a high Level alarm. What other factors would influence these alarm levels? (10 marks)

g) When Longwall 1 is finished the block detail, how you will seal the first Longwall? (20 marks)

Detail (5 marks each):

- i. What notification is required? – what is to be supplied to Regulator (detail this) What is the waiting period?
- ii. Hazards associated with sealing and, how they will be managed?
- iii. Detail / Show YOUR sequence of sealing with diagrams
- iv. Monitoring required? – any required in addition to Question 2(e)

UB3 - Coal mining practice

Written examinations held 16 October 2019

Instructions to candidates

You must select five of the eight questions to attempt.

All questions are of equal value - 20 marks each

10 minutes reading time is allowed prior to the start of the examination.

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

- 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
- Explosives Act 2003
- Explosives Regulation 2013

Question 1

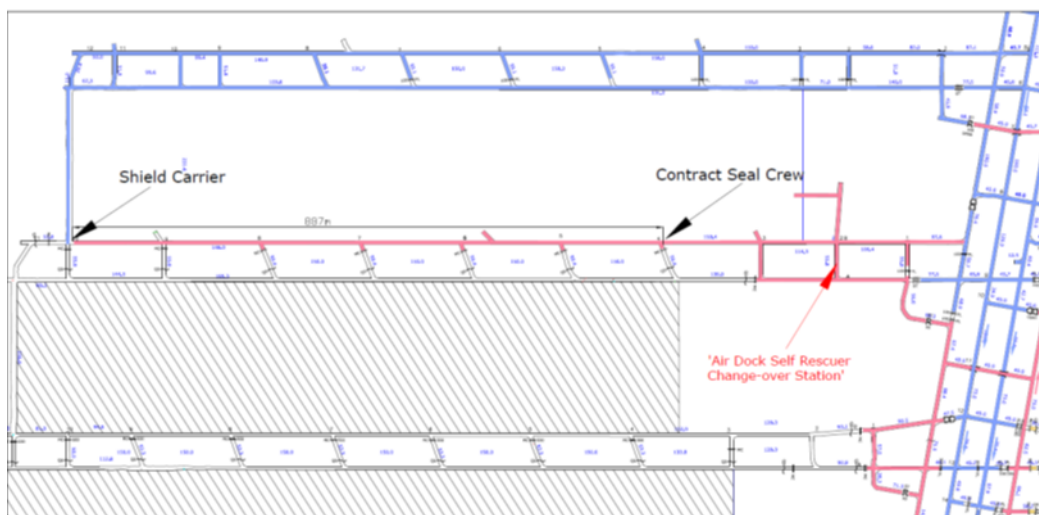
You are the afternoon shift undermanager at a longwall mine. The seam is gassy with the seam gas predominately methane. The seam is not liable to spontaneous combustion. The mine carries out extensive gas drainage to reduce the insitu gas content below outburst thresholds. The mine is operating two gas drainage rigs in the gate road panel outbye the face.

You receive a call from control that whilst pulling rods from a completed long hole, one crew has inadvertently moved the drill rig fracturing the standpipe and allowing an uncontrolled release of gas into the panel.

- Describe your immediate actions to recover this situation. (15 marks)
- You have been given responsibility for the event investigation, what measures would you implement to prevent a reoccurrence. (5 marks)

Question 2

You are the night shift undermanager of a longwall mine which is in the latter stages of a longwall installation and in the process of completing final seals on the previous longwall block.



You are conducting an inspection of an outbye part of the mine when you receive a message from the control room officer that a small fire has been extinguished on a diesel shield carrier machine at the tailgate corner of the installation face road.

A seal construction crew, comprising two contract workers, was working on the return side of the shield carrier and the workers had contacted the control room officer, stating that they had smelt smoke and donned their self rescuers and withdrawn to an air dock station. The air dock station is located in the return roadway and is fed with its own clean uncontaminated air supply (of 8 hours duration capacity). The air dock station is equipped with a phone, oxygen self rescuers and water.

- a) Detail the further information you would seek? (4 marks)
- b) Provide an outline of the immediate actions you would take including the instructions you would issue. (8 marks)
- c) Once control is gained, what post incident actions would you take on shift? (4 marks)
- d) What systems would require review following the incident? (4 marks)

Question 3

You are the nightshift undermanager at a longwall mine which is accessed by two intake drifts, a conveyor drift and a drive in RTV drift. The mine is operating at a depth of 300m and there are two additional shafts, an intake shaft and an upcast shaft.

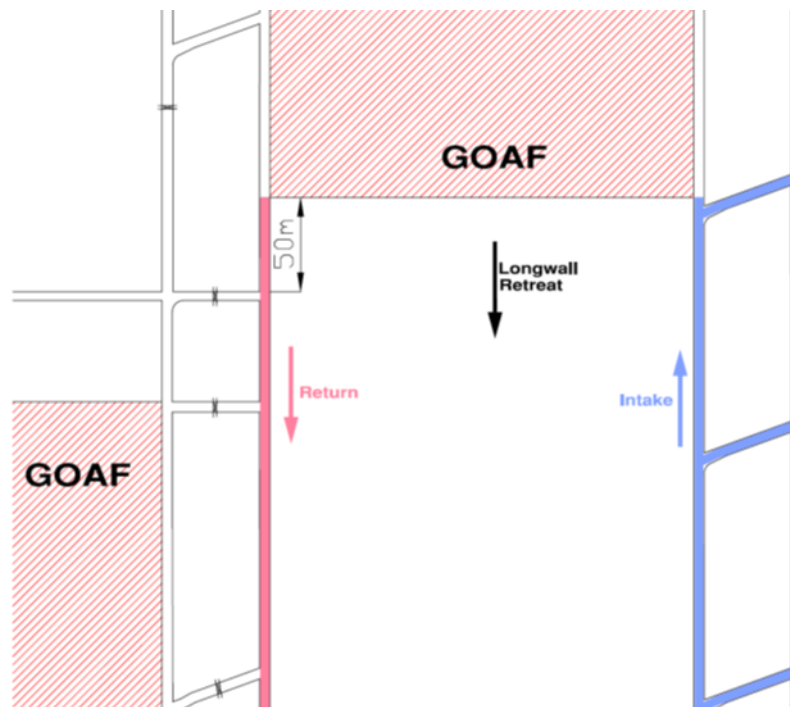
Your shift operates a longwall crew and three development units. You are contacted by control and advised that a roof fall 10m metres long and extending above the bolted horizon has occurred in the RTV drift blocking access.

- a) Describe your immediate actions to recover this situation? (6 marks)
- b) You have been tasked with the recovery operation describe how you would manage and carry out this process? (14 marks)

Question 4

You are the night shift undermanager of a longwall mine. The current longwall panel is longer than the previous panel and will be extracting past the starting position of the previous panel.

The longwall extracts the full seam height of 3.2metres. The immediate 2.0m of roof is comprised of weak laminated shale which is then overlain by strong competent sandstones.



You are in the mains development panel during a longwall maintenance shift when you receive a phone call from the longwall deputy informing you that whilst undertaking a planned inspection of the goaf seal (of shotcrete and mesh basket construction) 50m outbye the longwall face, he observed the roof of cut-through showing signs of deterioration. The deputy reported he was unable to access up to the seal due to concerns on roof stability, but he could see that there were visual signs of the seal being loaded with convergence and compromised with cracks. You aware from tube bundle monitoring that normally the atmosphere in the sealed goaf is 98% methane and 2% oxygen.

- What are the potential hazards of this situation? (4 marks)
- What additional information would you seek from the longwall deputy and other sources? (4 marks)
- What actions would you take including an outline of the recovery plan to manage the hazards? (8 marks)
- Assuming the issues in the cut-through and seal 50m outbye the longwall face are resolved, what further actions do you recommend be taken prior to the recommencement of longwall production? (4 marks)

Question 5

You are a shift undermanager of a moderately gassy longwall mine which 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 whilst you are on duty as the shift undermanager, outline the immediate actions you would take? (4 marks)

Question 6

You are the undermanager of an underground mine which will soon commence shot firing excavation of a hard dyke of 3m width which crosses through a longwall panel at 45 degrees. The seam is 2.8m thick with moderate methane gas content.

- a) Draw a shot firing pattern for excavation of the dyke, labelling key details. (6 marks)
- b) List the safety precautions that you would anticipate to be outlined in the Explosives Management Plan, in respect to steps required to be undertaken prior to the loading and firing of a shot. (7 marks)
- c) Indicate some factors which may cause a misfire? (3 marks)
- d) Outline the key steps to be taken in the event of a misfire. (4 marks)

Question 7

You are the weekend day shift undermanager at a longwall mine. During the shift you are informed that the longwall belt has tripped on tracking. On investigation, the belt has been damaged and a tear of 450m has been found with extensive spillage.

You have contacted the mine manager and he has charged you with managing the situation.

Outline the process/ steps you would undertake with this problem? Spare belt is available on the surface. (20 marks)

Question 8

You are the dayshift undermanager at a longwall mining operation. The mines' mains development has been slowed by a sill in the working section of the seam. This sill has a hardness of approximately 25mPa. Recent airborne dust samples have been taken which showed that both the CM driver and the deputy have exceeded statutory limits.

- a) What are the statutory limits for airborne dust? (5 marks)
- b) You have been tasked with carrying out the investigation into the failure and putting additional controls in place. Explain how you would complete this investigation and what you believe the additional controls will be? (15 marks)

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