

## Mining engineering manager of underground coal mines certificate of competence

### Instructions to candidates

Legislation to be assessed:

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

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

Work Health and Safety Regulation 2017

### MB1 – Mining Legislation

All five (5) questions are to be attempted.

All questions are of equal value – 20 marks each.

#### Question 1

As Mining Engineering Manager of an underground coal mine you have been informed that on holing a cut-through, the continuous miner has been flooded. It appears that water has accumulated in the adjacent roadway being holed.

- Describe the actions you will take. (5 marks)
- Assuming the incident needs to be notified to the Regulator, under what clause will the notification be given and why? (10 marks)
- What further actions are required under the legislation based on the notification of an incident to the Regulator? (5 marks)

#### Question 2

You are informed by one of your Undermanagers on shift that the Mine Safety and Health Representative has suddenly told the mining operators in the longwall to pull up and stop work due to a safety issue.

- When can a Mine Safety and Health Representative direct a worker to cease work? (10 marks)
- The safety issue that the Mine Safety and Health Representative is concerned about is regarding rough road conditions servicing the longwall panel which may result in poor emergency response to the longwall. What are your actions? (5 marks)
- The Mine Safety and Health Representative requests that the District Union Official attend site to resolve the matter. What action would you take? (5 marks)

### Question 3

Clause 55 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 deals with the requirements for the minimum standards for ventilated air. The ventilated air is to have dust levels that are as low as reasonably practicable, and do not exceed the relevant levels specified in clause 39.

- a) What is the specified respirable dust level in clause 39 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 for a coal mine. (5 marks)
- b) In your own words detail the actions you would take to ensure that respirable dust levels at the longwall are as low as reasonably practicable. (15 marks)

### Question 4

Part 3.1 of the Work Health and Safety Regulation 2017 deals with managing risk.

- a) In your own words describe what must a duty holder do in managing risks to health and safety? (5 marks)
- b) In your own words describe your understanding of the hierarchy of controls, providing an example for each? (15 marks)

### Question 5

The Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 clause 26 specifies the requirement for a Health Control Plan. Schedule 2 specifies the matters that must be addressed in the Health Control Plan. These include control measures for eliminating or minimising exposures to health hazards associated with the mining operation and fitness for work.

- a) What are the exposures to health hazards associated with the mining operation that are to be addressed in the health control plan? (10 marks)
- b) What are the matters to be addressed to ensure workers are fit to carry out work? (10 marks)

## MB2 - Mine Ventilation

Both questions are to be attempted

All questions are of equal value – 100 marks each

Answers are to be written in this booklet and on the plan provided only

### Ventilation Plan Description of Mount Breken Extended Colliery

Mount Breken Extended Colliery workings are shown on the attached plan.

The colliery works the “Greater Northern” seam, which has a medium propensity to spontaneous combustion, is 3.9 metres thick and is overlaid by 4.2 metres of sandstone.

Longwall mining height is the full seam thickness of the “Greater Northern” seam.

The immediate strata below the “Greater Northern” seam consists of a reasonably competent shale bed. There are a number of thin coal seams in the overlying strata.

The Mount Breken Extended Colliery workings are accessed via four short drifts at the foot of an escarpment. The Main mine fan is located on one of the Adits, adjacent to the escarpment.

The “Greater Northern” seam is best described as a wet and moderately gassy with a moderate permeability. Total in situ-seam gas content is typically 7 m<sup>3</sup>/t, with a CO<sub>2</sub>:CH<sub>4</sub> ratio of 35:65. Approximately 70% of insitu gas in the cut coal is liberated during the production process.

Typical roof support is a mesh module with 6 x 2.1 metre bolts per metre. Ribs are strong but prone to slab failure. Rib support consists of 1 x 1.2 metre bolt every metre.

The mine produces steaming coal from three Continuous Miners (CM) in development units seven days per week and a longwall panel (LW24) five days per week. The mine produces approximately 3.5 million tonnes per year. Two CM’s are advancing the 504 gate road panel, whilst a single CM is being used to develop the 500 District mains headings.

## Question 1

From the data supplied and a critical view of the plan:

- a) Identify and list all relevant critical issues and factors that you believe must be incorporated in, or be addressed by, the ventilation network you will adopt. Your answer should include but not be limited to issues regarding seam gassiness, seam thickness, goaf gas management, spontaneous combustion and the impact on ventilation management of multiple surface intakes and outlets. (50 marks)
- b) Explain and justify how each of the issues you have identified will be managed in your ventilation network. (50 marks)

## Question 2

On the accompanying plan of Mount Breken Extended Colliery:

- a) Estimate the daily production levels at each of the production faces. (15 marks)
- b) Ventilate the plan using the code of signs specified by Survey and Drafting Directions for Mine Surveyors, addressing issues that were identified in question 1. (30 marks)
- c) Show the air quantities entering each production area measured 100m from the last completed line of cut throughs. Calculate the general body methane and carbon dioxide content in each production area return (clearly state assumptions you are relying upon in these calculations). (20 marks)
- d) Show the locations and type of required atmospheric monitoring. (20 marks)
- e) Show the ventilation quantities entering each surface intake entry to the underground workings and each surface return entry from the underground workings. (15 marks)

## MB3 – Coal Mining Practices

Five (5) questions only are to be attempted for this paper -

Four (4) questions must be attempted from Section A – Underground coal mining

One (1) question must be attempted from Section B – Surface coal mining

All questions are of equal value – 20 marks each.

### Section A - Underground Coal Mining

#### Question 1

You are the Mining Engineering Manager at a large underground longwall coal mine. Due to the gas make the longwall utilises a “R” ventilation configuration.

- a) Sketch a simple “R” ventilation system for a longwall, indicate the location of any regulators and any gas monitoring required. (5 marks)

You have noted that there has been an increasing trend of gas exceedances picked up by the monitoring point at the bleed circuit regulator. The bleed return is on a separate ventilation split which extends past a series of extracted longwalls, in this case eight (8) longwalls. Longwall blocks are on average 3000 metres in length and width is 400 metres.

- b) List the possible causes that would result in the gas exceedances. (5 marks)  
c) Outline the options and strategies you could implement to reduce the likelihood of gas exceedances in the bleeder circuit. (10 marks)

#### Question 2

You are the Mining Engineering Manager at a modern longwall mine that is struggling with the rate of advance of development, both in the Main Headings and the gate roads.

The seam is 3.5 metres thick, with a competent floor and a thick sandstone roof.

You have been asked to review what other methods of development, other than the current widehead continuous miner “Cut & Bolt” method could be introduced.

- a) List any other methods of development you may consider. (3 marks)  
b) List the positives and negatives for each method. (5 marks)  
c) Explain how your preferred method would be introduced. (12 marks)

#### Question 3

You are the Mining Engineering Manager at an old underground coal mine that is going in to care and maintenance due to an economic downturn. The mine currently operates one (1) bord and pillar unit and two (2) development units on place change. The mine is moderately gassy and the mine pumps

approximately 2.5 megalitres of water a day. Due to the age of the mine there are a total of eight (8) adits providing access to the underground working. Considering health and safety:

- a) What actions would you take to prepare the mine for care and maintenance? (10 marks)
- b) List the issues that will need to be addressed as part of implementation of the care and maintenance plan. (10 marks)

## Question 4

You are the Mining Engineering Manager of a longwall mine that:

- Has currently found a non-porous 3.0 metre semi-hard dyke in the Main Headings
  - The ventilation is by dual returns and auxiliary fans.
  - The 6 x roadways were advancing up a grade of 1:25.
  - The seam is dry and moderately gassy with a conglomerate roof.
  - The mine next door recently experienced a “frictional ignition” at the working face.
- a) What actions would you take to safely advance through this area? (5 marks)
  - b) List the controls that would be in place or introduced to prevent a “frictional ignition” (10 marks)
  - c) Explain what is in your emergency procedure if a “frictional ignition” occurs. (5 marks)

## Question 5

You are the Mining Engineering Manager of a mine that is winning coal by “Pillar Extraction”.

- a) List the equipment that you are utilizing. (3 marks)
- b) Draw a plan of a section showing the size of the pillars and runouts. (7 marks)
- c) Show a sequence of extraction for a runout. (7 marks)
- d) Mark where “Stook X” is and any other strata support. (3 marks)

## Question 6

You are the Mining Engineering Manager of an underground coal mine using bord and pillar. One of the working panels has shown increasing levels of carbon monoxide and higher hydrocarbons, to the extent that you have made the decision to seal the panel.

The panel has three entry headings, from left to right, a return, a belt roadway, and a transport roadway. There are minimal levels of Methane in the return air, and this is normal for this seam.

- a) Explain, with the aid of drawings the steps you would take in sequence to safely seal this panel. (10 marks)
- b) List the precautions you would put in place to ensure the safety of people and equipment at the mine. (10 marks)

## Section B - Surface Coal Mining

### Question 7

You are the Mining Engineering Manager at an open cut mine.

The mine has just about to resumed production after two days of heavy rain.

- a) List the potential hazards that this rain event may cause. (5 marks)
- b) List the controls that you would have in place for these hazards. (10 marks)
- c) What would you have your OCEs do prior to commencement of production? (5 marks)

### Question 8

You are the Mining Engineering Manager at a small open cut coal mine. The mine has identified remnant coal off the highwall that can be recovered to supplement production. Strip ratios in the area make conventional mining methods unviable.

- a) List the methods available to recover coal from the identified area. (10 marks)
- b) For one of the methods identified, detail the risks associated with this method of mining and how you would control them. (10 marks)

## More information

NSW Department of Planning and Environment

Resources Regulator

Mining Competence Team

T: 02 4063 6461

Email: [minesafety.competence@planning.nsw.gov.au](mailto:minesafety.competence@planning.nsw.gov.au)

## Acknowledgments

### Mining engineering manager of underground coal mines examination panel

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