

EXAMINATION PAPER

Mining engineering manager of underground coal mines certificate of competence

Written examination 25 June 2019

Instructions to candidates

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

MB1 legislation

Question 1

As the 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.

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

Question 2

You are the mining engineering manager at a small underground coal mine. A decision has been made to engage a contracting firm to commence development of a drift to access another seam. This will involve shotfiring and support activities on a scheduled four-month project. The contractor intends to use labour from another state to staff the project. The contractor wishes to implement a time roster based on seven days on, seven days off rotating shift. The contractor has presented you with a copy of the roster.

Clause 22 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 states what the contractor is required to do before they can commence work.

In your own words, detail the obligations of the contractor and of the mine operator that would allow the project to commence. (20 marks)

Question 3

Section 14, Work Health and Safety (Mines and Petroleum Sites) Act 2013, outlines notifiable incidents.

- a) Describe your understanding of this requirement. (10 marks)
- b) In your own words, list the 'dangerous incidents' referred to in this section and where can they be identified in the Regulation. (10 marks)

Question 4

The *NSW Explosives Act 2003* No 39 and Regulation 2013 require certain licences to be maintained at a mine site for the mine to use explosives.

- a) List the licences required to be held for the mine to utilise explosives. (10 marks)
- b) In your own words, list the requirements to obtain a blasting explosives user's licence for an underground coal mine. (10 marks)

Question 5

Schedule 3 of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, documents high risk activities.

Section 10 of the above schedule covers 'sealing'.

- a) In your own words, describe the requirements of this section. (10 marks)

Section 16 of the above schedule covers 'secondary extraction or pillar extraction, splitting or reduction'.

- b) In your own words, describe the requirements of this section. (10 marks)

MB2 ventilation

Ventilation plan description - Egan Colliery

Egan Colliery workings are shown on the attached AO size plan.

The colliery works the 'Western Bain' seam, which has a low to medium tendency for spontaneous combustion, is 3.2 metres thick and is overlaid by 6 metres of mudstone. Mining height is the full seam thickness of the 'Western Bain' seam. The immediate strata below the 'Western Bain' seam consists of a thick, competent bed of sandstone. There are several thin coal seams in the overlying strata.

The Egan Colliery workings are accessed via four short portal drivages (adits) at the base of a highwall in a discontinued open cut coal mine. The main mine fan is on one of the adits, adjacent to the highwall.

The 'Western Bain' seam is moderately gassy with a moderate permeability. Total in-situ seam gas content is typically 8 m³/t, with a CO₂:CH₄ ratio of 20:80. Approximately 60% of in-situ 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, requiring rib support of 1 x 1.2 metre point anchor bolt every metre. The mine produces

steaming coal from three continuous miners in development units seven days per week and a longwall panel (LW100 West) five days per week. The mine produces approximately 3.6 million tonnes per year. Two continuous miners are advancing the tailgate headings, while a single continuous miner is being used to develop a main gate road for the new longwall panel LW1001.

Question 1 (total 100 marks)

Thoroughly reviewing the data supplied and the plan provided:

- 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 requirements for future mine ventilation. (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 (total 100 marks)

On the accompanying 'Egan Colliery' plan:

- a) Show the location of all production faces, together with their daily production levels. (20 marks)
- b) Ventilate the plan using the code of signs specified by the Regulations and Standards or survey drafting instructions, addressing the issues identified in question 1. (20 marks)
- c) Show the air quantities entering each production panel measured 100 m outbye the last completed line of cut-throughs. Calculate the general body methane concentration in each panel return. (20 marks)
- d) Show the air quantities entering each surface intake entry into the underground workings and each surface return entry from the underground workings. (20 marks)
- e) Show the locations and type of required atmospheric monitoring. (20 marks)

MB3 - Mining practice

Section A – Underground coal mining (choose four questions only)

Question 1

You are the mining engineering manager in a longwall mine. The mine is moderately gassy with a face width of 350 metres.

There is a tailgate recovery chute about 30 metres from the tailgate and one 30 metres from the maingate.

During a longwall recovery, the goaf, from the walker shields to the tailgate, has fallen in and the airflow has reduced to an inadequate level.

There is approximately 100 metres of face to be recovered back to the maingate recovery chute.

- a) What can be done to continue recovery of the longwall face? (Identify three alternatives) (5 marks)
- b) List some of the risks with the alternatives you have identified. (10 marks)
- c) List steps that identify how you would evaluate and implement the systems identified. (5 marks)

Question 2

You are the mining engineering manager of an underground mine with extensive older workings. In one area of the mine, you have experienced several roof falls in previous months in roadways that are generally not accessed.

Overnight, you have had a roof fall in an accessible cut-through used for a self-rescuer cache, between the belt road and travel road, that are respectively the second egress and primary egress. The cache has not been damaged.

- a) List your obligations/actions when the incident occurs. (10 marks)
- b) List what long-term actions you would take to ensure the safety of the mine. (10 marks)

Question 3

You are the mining engineering manager of a small mine that will shortly complete extraction of a herringbone secondary extraction panel. The panel is 1.2 kilometres long.

The panel is retreating to an area that is five headings wide with flanking returns with the conveyor in the centre roadway.

The panel is required to be sealed to minimise the risk of spontaneous combustion.

Due to the large open area of the panel and relatively low gas make, the panel could remain in the explosive range for one month.

- 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 and minimise the down time related to seal up. (10 marks)

Question 4

You are the mining engineering manager of an underground longwall mine. Due to deterioration in mining conditions and coal quality, a decision was made to relocate to a lower seam.

Both seams are moderately gassy, moderate potential for spontaneous combustion, with moderate amounts of water.

The seams both undulate and best drilling information indicates that seams do not come closer than 22 metres apart.

- a) What issues will need to be considered as part of the proposal to mine the new seam directly below the existing longwall workings? (10 marks)
- b) Outline the strategies you would implement to control these issues in the lower seam. (10 marks)

Question 5

You are the mining engineering manager at a large longwall mine. As part of company policy, the mine is moving from filter self-rescuers to a self-contained self-rescuer (SCSR) and compressed air breathing apparatus (CABA) set-up.

The mine has one longwall panel and two development panels. Generally, there are less than 10 people in each panel, on each shift. The mine normally changes over at the face.

- a) Identify what each face cached depot should contain and why? (5 marks)
- b) Identify what outbye panel cache should contain why? (5 marks)
- c) Identify what outbye mains caches should contain and why? (5 marks)
- d) Identify how you would determine cache spacings and how the escape strategy would be implemented? (5 marks)

Question 6

You are the mining engineering manager of an underground mine. One of the development panels has had a frictional ignition while negotiating a fault. The flame was reported to be about half the width of the miner (about 2.5 metres) and came back 2 to 2.5 metres over the cutter head of machine, fuelled by two methane gas blowers from the surrounding strata (points where methane gas is expelled from the coal and strata in the area being mined). The four workers on the machine responded to the ignition, initially with water hoses to control the fire, and subsequently with chemical powder fire extinguishers.

- a) Identify your immediate actions. (10 marks)
- b) Identify what actions would be required to safely recommence operations. (10 marks)

Section B – surface coal mining (Choose 1 question only)

Question 7

You are a mining engineering manager for a large open cut mine running electric shovels and hydraulic excavators. The overburden and coal contains high sulphur and is prone to spontaneous combustion throughout the deposit. Recently you have had an increase in community complaints. These were made to the EPA and relate to dust and odour. The EPA have requested a formal response from your mine.

The operators on site are also starting to make reports regarding the smell, mentioning that they are getting headaches and nausea.

- c) Outline how you would address the spon com problem on your site, including processes you use to implement changes. Include the major controls. (7.5 marks)
- d) A fitter has reported feeling ill while working on a field service in pit on a dozer. Describe your actions in dealing with this situation. (7.5 marks)
- e) The fitter is sent to hospital and receives medical treatment but released later that day. Is this a notifiable incident? (5 marks)

Question 8

You are the manager of a large surface mine. A change to the layout of the coal handling preparation plant has resulted in the introduction of a stockpile draw point and use of a dozer replacing the existing loader and hopper arrangement.

- a) Identify the key risks of this arrangement. (5 marks)
- b) Identify controls that would be put in place to control the risks that were identified. (5 marks)

You have just been made aware that the dozer (and driver) have fallen into a cavity above the draw point.

- c) List the steps you would take to control the situation and recover the dozer operator. (10 marks)

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