

## EXAMINATION PAPER | CERTIFICATE OF COMPETENCE

# Mining engineering manager of underground coal mines

May 2017

## MB1 – Mining legislation

### Instructions to candidates

Legislation to be assessed are

*Coal Industry Act 2001*

*Work Health and Safety Act 2011*

*Explosives Act 2013*

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

*And their supporting Regulations*

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.

### Question 1 (total 20 marks)

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 shot firing and support activities on a scheduled 4 month project.

The contractor intends to use labour from another state to man the project, but to do this the contractor wishes to implement an even time roster based on 7on / 7off rotating shift basis. 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.

### Question 2 (total 20 marks)

You are the Mining Engineering Manager at an underground longwall operation. The Industry Safety and Health Representative (ISHR) has attended site after a concern was raised in relation to a work health and safety issue at the mine involving contractor management. As a result of the inspection by the ISHR a provisional improvement notice has been served upon the mine in accordance with section 30 of the *Work Health and Safety (Mines and Petroleum Sites) Act 2014*.

- In your own words describe the actions that you must take on receiving the provisional improvement notice? (4 marks)
- In your own words list the options available to the mine operator in dealing with the provisional improvement notice? (16 marks)

## Question 3 (total 20 marks)

Clause 57 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* specifically deals with the requirements if air quality and air safety standards are not met.

- In your own words detail the actions to be taken by the mine should the methane concentration in the part of a mine exceed that specified in clause 72 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*. (18 marks)
- What is the specified methane concentration in clause 72 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*. (2 marks)

## Question 4 (total 20 marks)

Clause 9 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* specifically deals with management of risks to health and safety. In your own words outline the requirements of the risk management process as detailed in this clause. (20 marks)

## Question 5 (total 20 marks)

As Mining Engineering Manager at a longwall operation, a single entry is formed inbye the longwall as the longwall treats. Because of this practice the mine cannot comply with clause 96(1) *Emergency exits* of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

A decision has been made to apply for an exemption to this provision of the legislation

- In your own words describe what actions you would take to support the application for exemption. (16 marks)
- If the exemption is not granted, what options are available to the mine operator? (4 marks)

# MB2 – Mine ventilation

## Instructions to candidates

Legislation to be assessed are:

*Coal Industry Act 2001*

*Work Health and Safety Act 2011*

*Explosives Act 2013*

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

*And their supporting Regulations*

All questions are to be attempted.

All questions are of equal value - 100 marks each.

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

Pen is to be used for all written answers.

Please write your candidate number on your plan.

## Question 1 (total 100 marks)

Acres Colliery workings are shown on the attached plan.

Acres Colliery is a modern underground coal mine operated by the Hunter Coking Coal Company. Current production of 5 million tonnes per year, of semi-soft coking coal, is achieved by the state-of-the-art longwall supported by two (2) development units.

The workings are accessed via three decline drifts with the ventilation system returning via one concrete lined 5.5 metre diameter upcast ventilation shaft 180 metres long. Depth of cover has been increasing due to dip and the overlying topography. At the furthest inbye point of the mine depth of cover is around 500m.

The Hunter seam characteristics are as follows:

- seam is 3.1m thick with a specific gravity of 1.40 t/m<sup>3</sup>;
- in-situ content of 6m<sup>3</sup>/tonne, predominantly methane (CH<sub>4</sub>); and

- a medium propensity to spontaneous combustion.

Of note is the very wet 1.4m Stud seam. This seam is 5m above the Hunter seam as indicated from exploration borehole DDH2, however, as the mine has developed towards the west the Hunter and Stud seams have converged as indicated as indicated from exploration borehole DDH1.

Characteristic for the Stud seam are very similar to the Hunter seam.

Coal strength ranges from 14 to 20 MPa. Typical roof support is 6 x 2.1m fully encapsulated roof bolts and a 1.2m x 5.2m mesh module per metre.

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 (total 100 marks)

On the accompanying “Acres 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 – Coal mining practice

### Instructions to candidates

Legislation to be assessed are

*Coal Industry Act 2001*

*Work Health and Safety Act 2011*

*Explosives Act 2013*

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

*And their supporting Regulations*

Only five (5) of the eight (8) questions are to be attempted.

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

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

All questions are of equal value - 20 marks each.

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

Pen is to be used for all written answers.

## Section A - Underground Coal Mining

### Question 1 (total 20 marks)

The longwall mine you are the Mining Engineering Manager at has just commenced the extraction of their last longwall, a 250m wide block which will see the end to longwall mining in this area of the mine.

It has been identified that there will still be a viable coal resource for extraction after the completion of longwall mining in this area, being the remaining pillars that form the North Mains panel. After a review, a decision has

been made by Senior Management to extract the North Mains panel back to pit bottom, a distance of approximately 6000m.

North Mains is a 5-heading panel with flanking returns. Pillars are nominally 35m wide x varying lengths. Roadways are nominally 5.2m wide and the seam section is 3.2m. Roof support in the area consists of a mesh module on a standard 6 bolt pattern every 1m using 2.1m roof bolts. Rib support consists of 2 x 1.4m rib bolts every 1m.

- a) List the equipment / machinery that would be required to do pillar extraction. (5 marks)
- b) List the 5 x major hazards / risks associated with pillar extraction and the control measures you would implement to eliminate / mitigate those hazards / risks. (5 marks)
- c) What weekly production would you plan to achieve? (2 marks)
- d) Draw an extraction sequence. (8 marks)

## Question 2 (total 20 marks)

You are the Mining Engineering Manager, of a small underground coal mine. Production at the mine is 2 million tonnes per annum utilising place change.

You have been reviewing incident records and have noted an increase in incidents and reported “near misses” at the mine. Based on your understanding of place change mining practices:

- a) Based on your understanding of place change mining practices, list the type of incidents / near misses that you would expect to encounter (5 marks)
- b) List the controls you would implement to prevent these incidents / near misses. (5 marks)
- c) Detail the actions you would take to reduce these incidents / near misses (10 marks)

## Question 3 (total 20 marks)

At the longwall mine you are the Mining Engineering Manager and there have been 3 incidents over the last 4 months where the tail gate brattice wing has been damaged during production. As a result of the damage methane trips have occurred at the tail gate gas sensor and the tail gate return monitor has recorded a methane level in excess of 2.0%.

- a) List the obligations / action to be taken when the incident occurs. (5 marks)
- b) List the reasons that may lead to the tail gate brattice becoming damaged. (5 marks)
- c) Detail the actions you would take to ensure the events are not repeated. (10 marks)

## Question 4 (total 20 marks)

You are the Mining Engineering Manager at a new longwall mine that has encountered a very soft 3.2m thick dyke in the main gate development headings at 38c/t. There has been a large increase in water make associated with the dyke.

Exploratory drilling from the tailgate at 35c/t has intersected what would appear to be the same dyke at 41c/t, but it is 2.6m thick. The first longwall block is 250m wide x 5600m long.

- a) What issues / hazards would you expect development to have and what would you do to achieve safe drivage through the dyke? (10 marks)
- b) What issues / hazards would you expect the longwall to have and what would you do to achieve safe production? (10 marks)

## Question 5 (total 20 marks)

You are the Mining Engineering Manager at a deep longwall mine and you receive a phone call informing you that there has been a “slump of coal” on the longwall face just in front of the shearer midface. The “slump” is approximately 8m long x 3m high x 1.2m thick. Some of the coal spilled over the pans onto the walkway. Nobody was injured.

This event has not occurred at the longwall previously.

- a) Detail the actions to be taken on notification of the event. (5 marks)
- b) List the possible cause of the “slump”. (5 marks)
- c) Based on the potential causes of the event listed in b) above, list the control measures that could be implemented for each cause of the “slump”. (10 marks)

## Question 6 (total 20 marks)

You are the Mining Engineering Manager at a longwall mine and there has been a roof fall in the main gate dual unit belt road. The fall starts 30m back from the face and is approximately 13m long x 2.8m high. Due to plenty of warning the continuous miner was pulled back out by the fall and everyone is accounted for.

- List the potential factors that may have contributed to the fall. (5 marks)
- Briefly describe what the Deputy should do. (5 marks)
- Briefly describe what the shift Undermanager should do. (5 marks)
- Describe what actions you would take. (5 marks)

## Section B – Surface Coal Mining

### Question 7 (total 20 marks)

You are the Mining Engineering Manager of a small Surface mine where the results of a periodic airborne dust sample taken in February has shown a failed result for respirable dust to an operator of a dump truck.

- As the Mining Engineering Manager, describe your actions on receiving this information. (10 marks)
- List some of the possible causes for this result. (5 marks)
- List some of the corrective actions you would consider. (5 marks)

### Question 8 (total 20 marks)

You are the Mining Engineering Manager of a Surface mine that has received a copy of a Safety Bulletin from the NSW Resources Regulator about the increase in “truck rollovers” at open cut mines.

- As the Mining Engineering Manager, describe your actions on receiving this information. (10 marks)
- List some of the possible causes for “truck rollovers”. (5 marks)
- List some of the corrective actions you would consider. (5 marks)

## More information

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Mining Competence Team

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Mining engineering manager of underground coal mines examination panel

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (May 2017). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Planning and Environment or the user's independent advisor.

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