

# Undermanager written examination paper

## UB1 – Mining legislation

### Instructions to candidates

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*

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)

Clause 85 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* prescribes requirements for coal mine inspection plans.

- a) What does the mine operator need to ensure as part of the inspection plan for the mine? (8 marks)
- b) Where mining operations are taking place, what inspection frequencies must be carried out under the inspection plan? (12 marks)

### Question 2 (total 20 marks)

Clause 88 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the Operator to prepare an emergency plan.

- a) An emergency plan needs to address what aspects of emergency response? (14 marks)
- b) What statement is required for the activation of the plan? (2 marks)

Clause 93 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the Operator to test an emergency plan.

- c) What is the requirement for testing of the emergency plan? (4 marks)

### Question 3 (total 20 marks)

What are the obligations outlined in Clause 52 of the Work Health and Safety (Mines and Petroleum) Regulation 2014 in respect to supporting an area of unsupported ground or strata? (20 marks)

### Question 4 (total 20 marks)

State the requirements for connecting workings as specified in Clause 46 of the Work Health and Safety (Mines and Petroleum) Regulation 2014. (20 marks)

### Question 5 (total 20 marks)

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 are developing a full set of management systems. You have been asked to develop the workforce consultation arrangements including establishment of the Health and Safety Committee in accordance with the WHS legislation.

Explain the necessary arrangements and legislative considerations required to be put in place at this mine. (20 marks)

## UB2 – Mining ventilation

### Instructions to candidates

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*

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.

Please write your candidate number on your plan

### Question 1 (total 100 marks)

Williams Colliery is a bord and pillar mine utilising the cut and flit method of development and partial extraction method of mining. There are four continuous miners operating. The 702 extraction panel produces on average 1,800 tonnes of coal per production shift on a Monday to Friday production roster of three 9 hour shifts per day.

The operation mines the lower 3.0 metres of the “Leverage Seam” with total coal seam thickness being 4.6 metres. The seam is moderately gassy with a methane content of 5 m<sup>3</sup>/tonne. Historical data indicates that 50% of the gas content of the CUT coal is liberated during production.

The seam is considered to have a reasonably consistent grade across the lease. Water make in the mine is considered moderate.

Following drivage of three drifts through a large fault, the operation is developing the Eastern area of the lease to extend the life of the mine once the 700 area panels have been extracted.

The mine has recently experienced its first known incident of a heating in one of the old Northern area panel goaves. 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. (35 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) Briefly provide suggestions on what appropriate measures could be adopted to minimise the risk of a heating in future panels. (10 marks)
- e) Based on your assumptions and the information provided, calculate the general body methane content in the 702 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. (20 marks)

## Question 2 (total 100 marks)

- a) 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)

- b) Identify and explain the hazards associated with ventilation in a bord and pillar mine which utilises the cut and flit method of development and partial extraction method of mining coal. (20 marks)
- c) Discuss the primary methods you would expect to be implemented at the Williams Colliery for the management of hazards associated with airborne dust and why those methods would be appropriate. (15 marks)
- d) What spontaneous combustion management hazards have you identified for Williams Colliery mine layout? (10 marks)
- e) Describe the monitoring arrangements you would expect to be implemented at Williams Colliery, where you would expect to position the monitoring and why you choose those arrangements. (15 marks)

## UB3 – Coal Mining Practice

### Instructions to candidates

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*

You must select five of the eight questions to attempt.

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

### Question 1 (total 16 marks)

You are an undermanager of a longwall mine which has a conveyor tripper drive installation in progress in a homotropical ventilated two heading gateroad development panel.

You receive a phone call from the control room officer informing you that the gateroad development panel deputy has phoned to advise of rising methane gas concentrations in the panel with levels up to 1.0% concentration across the most inbye cut-through.

The control room officer has also advised you that the crew installing the tripper drive had reported a breakdown of a LHD machine carrying a load through the double doors and that both double doors in the tripper drive cut-through were open causing intake air to short circuit to the return.

The tripper drive cut-through is 1,000m outbye the most inbye cut-through of the panel.

- a) Outline your immediate actions. (6 marks)
- b) You have been made responsible to implement measures to minimise the potential for re-occurrence of this incident. What are the measures you would implement? (4 marks)
- c) Assuming the diesel LHD machine breakdown is not readily repairable and the double doors are unable to be closed due to the machine position, describe the measures you would arrange for the restoration of ventilation to the gateroad panel inbye the tripper cut-through double doors? (4 marks)
- d) Once ventilation is restored inbye the double doors, what inspections and checks would be made prior to resuming normal operations? (2 marks)
- e) Question void – copy of question 1b).

### Question 2 (total 20 marks)

You are the night shift Undermanager of a moderately gassy longwall mine and you have just been notified by the control room officer that the power has tripped off the longwall face via the interlocked methane monitor at the tailgate end of the longwall face as the shearer cut into the tailgate roadway.

You have been advised that the real time methane detector at the outbye end of the tailgate roadway detected methane concentrations exceeding 2.0% for a three minute period directly after the longwall face power trip, peaking at 2.3% concentration and since returning to normal tailgate methane concentrations of 0.5%. The longwall panel has U-type ventilation arrangement.

- What are possible causes of the elevated methane levels that were incurred in the tailgate roadway? Consider a range of possibilities. (6 marks)
- Outline the steps you take on receiving this information. (7 marks)
- Outline control measures that would be appropriate for the mine to consider in minimising the potential for re-occurrence of exceedances of 2.0% methane in the longwall tailgate. (7 marks)

### Question 3 (total 20 marks)

You are an Undermanager of a mine planning to develop a two heading panel within 50m of flooded workings. The mining engineering manager has asked you to develop plans and procedures to conduct the mining.

- What process would you follow in developing the plans and procedures? (6 marks)
- List the control measures that you would expect to be in place to manage the hazards of mining adjacent to flooded workings? (6 marks)
- Provide detail on the response measures you would have in place in the event excessive water make during mining was being experienced? (4 marks)
- When on shift as the Undermanager, how would you ensure the plans and procedures that had been developed were effectively implemented? (4 marks)

### Question 4 (total 20 marks)

You are the weekend dayshift undermanager at a longwall mining operations. You are informed by the longwall deputy that the shearer operator has informed you of smoke while cutting into the maingate.

The smoke was seen and smelt by the shearer operator in the general air flow at the number 6 shield in the Maingate. A boot end operator reported that he thought the smoke was coming from the tail roller. He stopped the belt, production was ceased and the area hosed down with a 1" hose. There is no smoke present now.

- Explain your immediate response. What are possible sources of the smoke? (8 marks)
- Outline the process you would follow and how you would investigate the incident with a view of understanding the cause. (6 marks)
- What process would be followed to recommence production? (6 marks)

### Question 5 (total 20 marks)

Periodic weighting can significantly influence the safety and productivity of longwall operations.

- What are the factors that contribute to periodic loading? (10 marks)
- What are available methods for prediction and prevention of periodic weighting events on longwalls? (10 marks)

## Question 6 (total 20 marks)

You are an undermanager on mid-week night shift. While on the longwall face the longwall deputy informs you of deteriorating roof along the panel travel road 150m outbye the longwall face. On investigation there is 30m guttering leading into the intersection.

- a) Explain your immediate response and what actions would be taken. (8 marks)
- b) On the following shift, a roof fall occurs with no injuries. The mining engineering manager tasks you with the project to recover the fall.

Outline the process you would follow to plan recovery of the fall. Identify 2 consolidation techniques that may be used. (12 marks)

## Question 7 (total 20 marks)

You are the undermanager in charge at a mine. Entry to the workings is by two drifts. The main access is via a men and materials drift of 600 metres in length and a grade of 1 in 3. This drift is serviced by a haulage system rated at 84 tonnes capacity.

The other access is via the conveyor drift of 700 metres in length and a grade of 1 in 3.5. This conveyor drift also has a rope haulage of 12 tonnes capacity and can be used for limited transport of men and materials. The drifts are connected by a cut-through at the pit bottom area.

You are on the surface and receive a call 30 minutes before the end of day shift. The call is from the control room who gives you the following information:

- The main drift haulage was travelling outbye and approximately 100 metres from the surface derailed
  - The dolly car is connected to a flat top with an Eimco 913 secured on it
  - The operator of the dolly car felt the dolly car lift off the rails and continue travelling outbye for approximately 1 metre before stopping
  - On inspection the operator said the inbye wheels of the dolly car and the outbye wheels of the flat top were off the rails.
- a) What would be your first actions to ensure the safety of the mine and its employees? (7 marks)
  - b) What notifications would you consider appropriate to be required in a situation of this nature? (3 marks)
  - c) What approach would you use to assess the situation and develop a procedure to return the operation of the drift to normal? (4 marks)
  - d) Briefly describe a method of replacing both the flat top and dolly car back onto the rails (4 marks)
  - e) At what point would you declare the drift and haulage safe to use? (2 marks)

## Question 8 (total 20 marks)

You are an undermanager at an underground coal mine, and within a period of the past two months, this mine has experienced three roof falls in development roadways. All the failures have occurred in roadways driven within the previous six months period in a new area of the mine and have been on or about intersections.

Primary support at the face comprises of mesh and chemically anchored roof bolts. Secondary support is set on a needs basis and comprises of 8 metre long cable bolts. There have been no roof failures where secondary support is installed.

It is necessary to investigate this problem and produce a report with recommendations on a program of work to determine cause and measures to control this situation.

You have been asked to address this strata issue, explain how you would approach this task. (20 marks)

© State of New South Wales through the NSW Department of Planning and Environment 2017.

This publication is copyright. You may download, display, print and reproduce this material in an unaltered form only (retaining this notice) for your personal use or for non-commercial use within your organisation. To copy, adapt, publish, distribute or commercialise any of this publication you will need to seek permission from the NSW Department of Planning and Environment.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (November 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.

PUB17/712