

EXAMINATION PAPER | CERTIFICATE OF COMPETENCE

Undermanager of underground coal mines

August 2016

UB1 – Mining legislation

Instructions to candidates

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

Work Health and Safety Act 2011

Work Health and Safety Regulation 2011

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.

Pen is to be used for all written answers.

Question 1 (total 20 marks)

Section 29 of the *Work Health Safety (Mines and Petroleum Sites) Act 2013* states the “Functions of Industry Safety and Health Representatives”. What functions are stated in this section?

Question 2 (total 20 marks)

Clause 76 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* prescribes requirements if air quality or safety standards are not met.

- What are these requirements? (15 marks)
- For the purpose of this clause, when is an accessible place at an underground mine taken to be at risk? (5 marks)

Question 3 (total 20 marks)

Clause 128 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the Operator to notify of certain incidents.

- What must the operator do to comply with this clause? (4 marks)
- How must the notification be made? (4 marks)
- What are the high potential incidents defined in clause 128 (5)? (12 marks)

Question 4 (total 20 marks)

List the requirements for Clause 23 – Identification of principal hazards and conduct of risk assessments, *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Question 5 (total 20 marks)

List the requirements for Clauses 15-17 (inclusive) of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* relating to standards, maintenance and review of Safety Management Systems.

UB2 – Mine ventilation

Instructions to candidates

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

Work Health and Safety Act 2011

Work Health and Safety Regulation 2011

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.

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)

Jacob's Creek Colliery workings are shown on the attached plan.

The colliery mines a working section which combines the "Williewarrina" seam, a 600 mm sandstone /shale band, and the lower section of the "Wonga" seam. Both seams have a low to medium propensity to spontaneous combustion.

To address geotech, coal product specification and mining equipment restraints, mining height is 3.7 metres, leaving 1.2 metres of top coal, overlaid by 2 metres of shale and 8 metres of mudstone.

The immediate strata below the "Williewarrina" seam is a thick, reasonably competent bed of sandstone. There is a thick, poor quality coal seam in the overlying strata.

The Jacob's Creek Colliery workings are accessed via one transport drift and two belt drifts from the pit top, which is located at the foot of a hillside. There is also one 5.5 metre diameter 120 metres deep, concrete lined upcast ventilation shaft.

The combination of the "Williewarrina" and "Wonga" seams is moderately gassy with moderate permeability. Total in-situ seam gas content is typically 6 m³/t, with a CO₂:CH₄ ratio of 10:90. Approximately 50% of the in-situ gas in the cut coal is liberated during the production process.

The depth of cover for the working seam ranges from 120 metres adjacent to pit bottom to 340 metres in the Eastern parts of the lease. A considerable number of low displacement faulted zones exist across the lease.

With improving Coking coal prices the mine is developing both the 900 and 800 districts in parallel with the expectation that the mine will operate two longwall faces in the future.

Currently the mine produces Coking coal from one Longwall panel (Longwall 920) supported by three development panels; 930 maingate panel, the new 800 maingate panel, (both super units) and 800 district mains development (single CM unit).

The mine produces approximately 4.4 million tonnes per year.

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) On the plan document the air quantities you would expect to be entering each production panel measured at the commencement of the hazardous zone. In the space below provide an explanation of why these quantities have been chosen. (15 marks)
- d) Based on your assumptions and the information provided calculate the general body methane and carbon dioxide content in the LW 920 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 those 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 the relevant hazards associated with the ventilation of this mine and 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 the 600 mm sandstone/shale band in the working section, for both Longwall and Development operations. (20 marks)
- c) Discuss the primary methods you would expect to be implemented at the Jacob's Creek Colliery for the management of hazards associated with airborne dust and why those methods were appropriate. (15 marks)
- d) What spontaneous combustion management hazards have you identified for Jacob's Creek Colliery? (10 marks)
- e) Describe monitoring arrangements you would expect to be implemented at Jacob's Creek 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 the

Work Health and Safety Act 2011

Work Health and Safety Regulation 2011

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

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

Only five (5) of the eight (8) 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.

Pen is to be used for all written answers.

Question 1 (total 20 marks)

You are the weekend dayshift Undermanager at a longwall mining operations. You are informed by the Mining Engineering Manager that the shearer driver and Deputy on your crew have returned 14 mg/m³ and 11 mg/m³ respectively on inhalable dust.

- a) What actions would you take? (3 marks)
- b) What are exposure limits for dust and explain the different health risks associated with these different limits? (9 marks)
- c) What are the mitigation measures you would have in place for a modern longwall operation? (8 marks)

Question 2 (total 20 marks)

- a) What is an outburst and what are the primary methods used to mitigate outburst risk? (4 marks)
- b) Name 6 indicators of an outburst. (6 marks)
- c) Explain thresholds used for outburst management. What is the role of thresholds? (4 marks)

- d) Explain 2 mining methods used for high gas contents. (6 marks)

Question 3 (total 20 marks)

You are an Undermanager on mid-week night shift. While on the longwall face you receive a call from the control room operator that an incident has occurred in the Mains Development Panel. An operator has had his arm pinned between the rib and rib bolter. It is reported that the arm is broken and he is on his way to the surface.

- a) Explain your immediate response. (7 marks)
b) Outline the process you would follow to investigate the incident with a view of understanding the cause? (7 marks)
c) What process would be followed to recommence production? (6 marks)

Question 4 (total 20 marks)

- a) Explain the difference between Full Pillar Extraction and Partial Pillar Extraction and draw an example of each. (6 marks)
b) What are the reasons why Partial Pillar Extraction is used instead of Full Pillar Extraction? (8 marks)
c) Explain the "Duncan Method" of Partial Pillar Extraction including diagrams and extraction sequences. (6 marks)

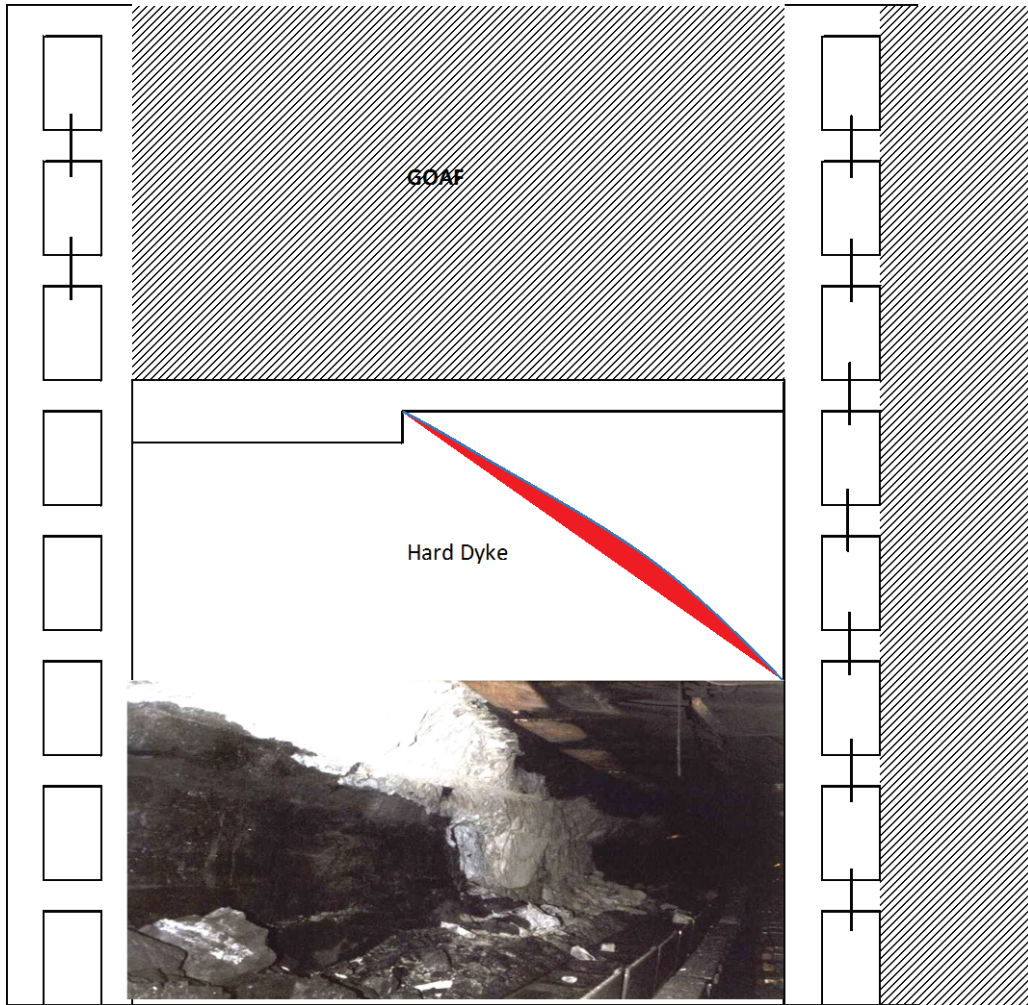
Question 5 (total 20 marks)

You are an Undermanager at a modern continuous miner operation that uses the Place Change mining system. The Mining Engineering Manager has asked you to investigate an increase in trailing cable damage at the mine with the view to develop and implement a Cable Management Plan.

- a) How would you go about this task and who would you involve? (4 marks)
b) What are five causes of cable damage in this type of operation? (4 marks)
c) What are five hazards associated with cable damage in the face area? (4 marks)
d) Describe five procedures or standards that would reduce the hazards as mentioned for a Place Change operation. (4 marks)
e) As the Undermanager, what is your response to a report that arcing or evidence of arcing has been observed in the hazardous zone? (4 marks)

Question 6 (total 20 marks)

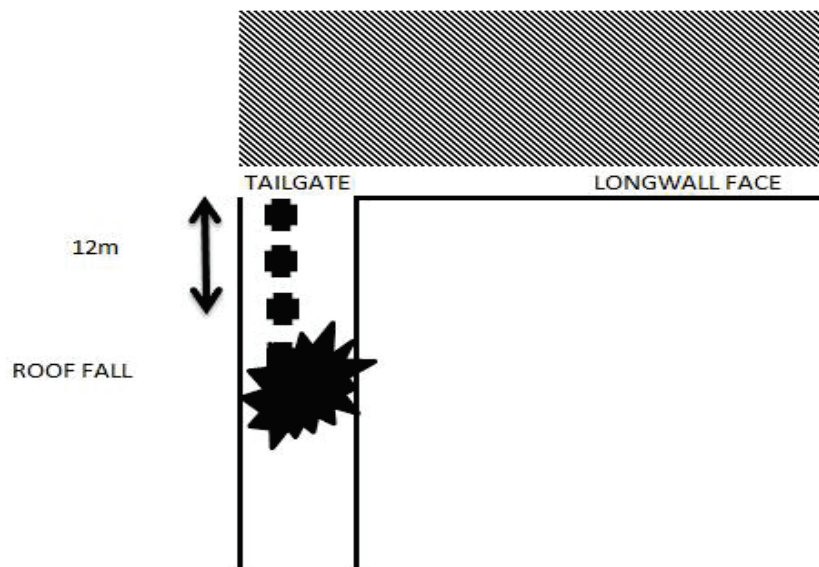
- a) Explain the difference between "Uni-Di" and "Bi-Di" cutting on a longwall, including advantages and disadvantages of both methods. (5 marks)
b) During the extraction of a longwall block, a large dyke has been encountered that is unable to be extracted with the shearer (see overpage). Explain how you would develop a safe system of work to extract this section of the longwall block using explosives. Include the details of the system. (15 marks)



Question 7 (total 20 marks)

As the Undermanager on shift you receive a phone call from a crew of workers who have been sent into the Tailgate to erect secondary support who have found that there has been a roof fall around the last tailgate link-n-lock.

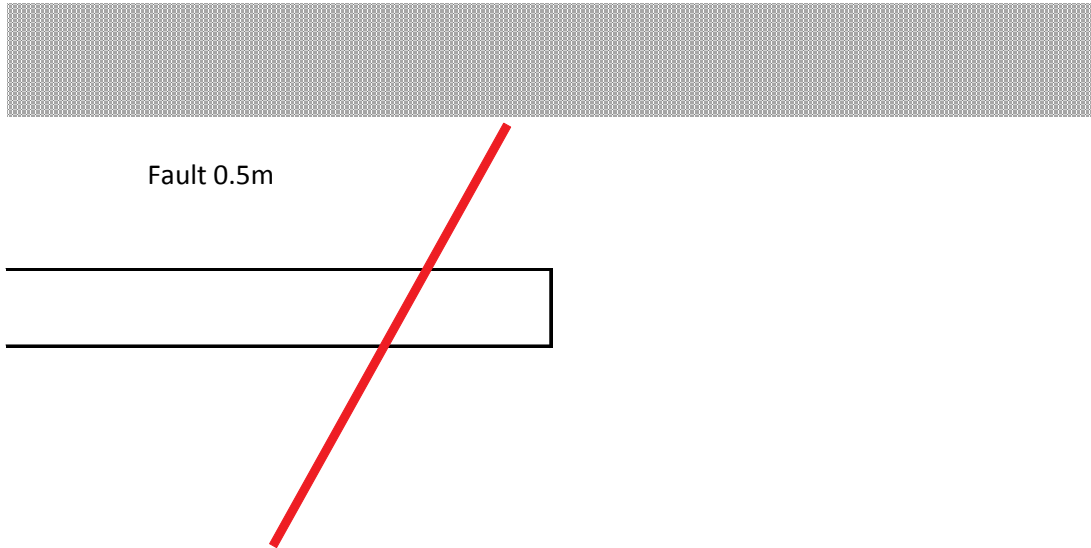
- a) What may have contributed to this roof fall occurring? (10 marks)



- b) What notifications, if any, to the Inspectorate are required and under which relevant parts of legislation? (2 marks)
- c) What actions and resources could be put in place to minimise the likelihood of this event occurring again in relation to the failure modes you have identified in (a)? (8 marks)

Question 8 (total 20 marks)

- a) During the driveage of a split for “double sided” pillar extraction operations, a fault is encountered which is 0.5m displacement with poor conditions encountered for 2m each side of the fault.
 - i) What risks does this pose for future lifting operations through this area? (4 marks)
 - ii) What controls are required to allow safe operations through the faulted area? (6 marks)



- b) During the extraction sequence of this block, on the goaf side, the CM holes the goaf at 8m instead of 11m as planned.
 - i) What potential failures have occurred in the previous split and lift on the solid side of the previous lift? (4 marks)
 - ii) What processes to need to occur to ensure that safe operations can continue? (6 marks)

More information

NSW Department of Industry
Governance Branch
Mining competence unit

T: 02 4931 6625

Email: minesafety.competence@industry.nsw.gov.au

Acknowledgments

Undermanager Examination Panel

© State of New South Wales through the Department of Industry, Skills and Regional Development 2016. You may copy, distribute and otherwise freely deal with this publication for any purpose, provided that you attribute the NSW Department of Industry, Skills and Regional Development as the owner.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (October 2016). 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 Industry, Skills and Regional Development or the user's independent advisor.

PUB16/471