



EXAM PAPER | CERTIFICATE OF COMPETENCE

# Mechanical engineer

SEPTEMBER 2015

## **CME3 Safety and mining legislation applicable to open-cut coal mines**

**Examination date:** Wednesday 16 September 2015

**Examination time:** 1:30pm – 3:30pm

**Examination venue:** Hunter TAFE, Kurri Kurri

**Instructions to candidates:**

It is expected that candidates will present their answers in an engineering manner making full use of diagrams, tables and relevant circuits where applicable and showing full workings in calculations. Credit marks will be given for such work in assessing marks for these questions. Neatness in diagrams is essential and will be considered in the allocation of marks.

Provide answers in point form wherever appropriate. If you are unable to fit your answers in the available space, you may use the space on the opposing page. Three (3) blank pages have also been included at the end of the paper. Ensure the question you are answering is clearly marked.

Electronic aids may not be used, apart from a non-programmable calculator.

**All questions are to be attempted.**

All questions are of equal value, but parts of questions may vary in value. The marks applicable to each part of a question will be indicated adjacent to the question.

Place your identification number only, NOT your name, on your paper.

10 minutes reading time is allowed prior to the start of the examination. Candidates can use a highlighter to mark points of importance during the reading time, but may not begin answering the questions.

PART A is **open book**.

PART B is **closed book**.



## **PART A**

### **Question 1 (25 marks)**

The following questions relate to the *Work Health and Safety Regulation 2011*.

- a) In “managing risks to health and safety”, what are the six (6) main elements you are required to comply with? In providing your answer, list the relevant clause numbers as well as clause headings.
- b) You have been nominated to exercise the statutory function of mechanical engineer at a coal mine that is not an underground coal mine. Briefly describe how you would ensure compliance with each of the clauses identified in part (a).

### **Question 2 (25 marks)**

The following questions relate to the *Work Health and Safety Regulation 2011*.

For “a person conducting a business or undertaking involving the management or control of plant”:

- a) What are the “additional control measures for general plant” you should consider? In providing your answer, list the relevant clause numbers from the regulation as well as clause headings.
- b) Describe the management systems you would have in place to ensure compliance with this subdivision of the regulation.

### **Question 3 (25 marks)**

The following questions relate to the *Work Health and Safety (Mines) Regulation 2014*.

“Mechanical engineering control plan (MECP)”

- a) List the risks to health and safety associated with the mechanical aspects of plant and structures that the MECP must set out control measures for.
- b) For each of the risks listed in part (a) above, give an example of a specific hazard that may be present at a coal mine other than an underground coal mine that would create the risk to health and safety.

**PART B****Question 4 (25 marks)**

Multiple choice – select the most correct answer from the options available. Select only one response to each question. Place a cross in the box corresponding to your answer, for example .

- 4.1 Hydraulic intensification can occur in:
- a) Hydraulic cylinders
  - b) Accumulators
  - c) Needle valves
  - d) All of the above
- 4.2 LPG bulk storage tanks must be inspected:
- a) Monthly
  - b) Annually
  - c) Every three (3) years
  - d) Not at all
- 4.3 The after-cooler of a reciprocation compressor is used to:
- a) Cool the compressor
  - b) Remove condensation
  - c) Reduce air density
  - d) Reduce air temperature
- 4.4 All signs, labels and warning notices should be designed and installed in accordance with:
- a) AS 1318
  - b) AS 1319
  - c) Both AS 1318 and AS 1319
  - d) None of the above
- 4.5 The isolation of equipment while being repaired should be carried out by:
- a) Nominated mechanical engineer
  - b) The equipment operator
  - c) Job supervisor
  - d) All persons working on the job
  - e) All of the above
- 4.6 When designing risk assessment to determine safety-critical component integrity, which Australian Standard would you refer to:
- a) AS 4240
  - b) AS 4024
  - c) AS 4100
  - d) AS 4808
- 4.7 All fluid power components have a minimum factor of safety of:
- a) 4.0 to 1
  - b) 3.0 to 1
  - c) 2.5 to 1
  - d) 2.0 to 1
  - e) None of the above

- 4.8 What element or elements should be contained in a plant safety file:
- Risk control measures
  - Plant alterations
  - Change of procedures, monitoring, audit and review reports
  - All of the above
  - None of the above
- 4.9 The Mechanical Design Guide (MDG) for fluid power system safety at mines is:
- MDG 10
  - MDG 16
  - MDG 36
  - MDG 41
  - None of the above
- 4.10 Wire ropes may deteriorate due to some of the cumulative effects of the following:
- Lightning strikes
  - Localised heating
  - Fretting
  - Corrosion
  - All of the above

### Question 5 (25 marks)

As the mechanical engineer nominated to exercise the statutory function of mechanical engineer by the mine operator, you have been given a submission for review and comments from the manager of the coal preparation plant. The submission relates to the purchase of a mobile elevated work platform (MEWP) with a maximum reach of 15 metres.

- List five (5) major points of consideration you would expect to see in the submission.
- Identify five (5) activities where a MEWP may be able to be used on a mine site.
- Set out a risk assessment in simple tabular form, that may form part of an introduction of plant to site process with two (2) columns: (1) Hazard and (2) Controls. There is no need to risk rank in your answer.

The risk assessment should cover the life cycle of the plant and cover all hazards and controls including safety features of the MEWP.

- How would you ensure operators are competent to operate the MEWP?
- List the items you would expect to find in the pre-operation checklist for this item of plant.

### Question 6 (25 marks)

As the mechanical engineer nominated to exercise the statutory function of mechanical engineer by the mine operator for a surface coal mine, you are aware of a series of light vehicle incidents within a two (2) week period.

These incidents include:

- A fire on a light vehicle (LV)
  - Light vehicle run away from the parking area resulting in a vehicle rollover
  - Light vehicle service brake failure as the light vehicle was being driven down a steep ramp
- In chronological order, list in point form the steps you would take in investigating these incidents.
  - List the system failures that may have led to the light vehicle incidents.
  - Prepare a list of recommended controls from the system failures identified in the above question
  - From your investigation, how do you intend on implementing changes to your processes?
  - List the processes you would recommend be implemented to prevent reoccurrences.

**Question 7 (25 marks)**

As a result of recent thickness testing carried out on your “Run of Mine Bin”, the lower half of the cone will require replacement during the Easter shutdown period.

The proposed repairs will involve:

A contracting company being engaged to manufacture and install the new cone section during the Easter shutdown period.

- The removal of the vibrating feeder from under the bin and replacement when the repairs are completed
- Cutting off the worn cone section and removing it
- Welding the new cone section into position

The process will involve the use of, the following equipment:

- Lifting equipment
- Scaffolding
- Mobile elevated work platform (MEWP)
- Electric welding equipment
- Gas cutting equipment
- Electric power tools

Other relevant information:

- Hot work processes
  - Installation of internal bracing in the bin to prevent distortion when the cone section is cut off
  - Working 24/7 until repairs are completed
- a) List the matters (people, process and equipment) that will need to be addressed with this work.
  - b) List controls to be taken to ensure the work is carried out in a safe and efficient manner.
  - c) List the documentation you would expect the contracting company to provide you.
  - d) What can be done to prevent the new cone from deteriorating?
  - e) List the activities associated with these works that would be classified as “high risk” in terms of the *Work Health and Safety (Mines) Regulation 2014*.

**Question 8 (25 marks)**

You are the mechanical engineer nominated to exercise the statutory function of mechanical engineer by the mine operator of an open-cut coal mine that incorporates a coal preparation plant and rail-loading facility.

Your preparation plant has a 500,000 tonne washed coal stock pile and utilises a 150m long reclaim tunnel to transfer washed product via a reclaim conveyor to the rail-loading facility.

- a) List five (5) hazards associated with conveyors operating in a reclaim tunnel.
- b) List five (5) typical controls used to limit the access of personnel when undertaking maintenance and inspection.
- c) List five (5) typical items or equipment systems that are associated with the design and operation of a reclaim tunnel in providing a safe working environment.
- d) List five (5) types of monitoring systems that could be found within a reclaim tunnel.
- e) List five (5) different reference documents you would consult when developing a management system for the reclaim tunnel.

**END OF PAPER**

## **More information**

Business Process and Authorisations Unit – Phone 4931 6625

## **Acknowledgments**

Mechanical engineer examination panel

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