

**THE INSTITUTION OF MATERIALS, MINERALS & MINING**  
**THE EXAMINATION IN MINING HEALTH & SAFETY LAW 2006**

**Wednesday, 14<sup>th</sup> June 2006 - 10.00am - 12.30am**

**SECTION A**

**('Open Book') - Mining Legislation and its Application**

- **Candidates are allowed to use, for reference, any of the permitted books, copies of Acts, Regulations and Approved Codes of Practice - any of which may be annotated - to answer questions in this Section.**
- This section carries 60 marks and comprises four (4) questions from which **TWO (2)** should be attempted. All questions carry equal marks.
- Candidates should note that in answering any question, reference to more than one set of Regulations and any associated ACOP is required.
- In order to pass the Examination, candidates are required to obtain not less than 50% of the marks in each of Section A and Section B.

**Time Allowed: 2 hours 30 minutes**

## SECTION A

### QUESTION A1

In a single length of intake airway in a coal mine, which was virtually dry throughout, a conveyor belt patrolman was walking inbye and examining a conveyor belt installation. Immediately after passing the drive and loop-take-up units he noticed flames around a bottom belt idler set. The conveyor belt was rubbing heavily on the conveyor structure at a sharp change of grade in the roadway, and the flames had spread to a large amount of coal spillage that had accumulated below it. He stopped the conveyor and, not being able to find means of fighting the fire, he ran outbye to the nearest telephone. The surface control was informed and a team of men was promptly organised to fight the fire.

On their arrival at the scene, they found that the fire had spread inbye along the roadway and attempted to extinguish it using water from the nearest available point, which was from a hydrant situated in a nearby cross connection to the main return. However, they could not reach the front of the fire that was propagating inbye along the conveyor belting.

At the time there were 51 persons working inbye of the fire and several noticed smoke, raised the alarm, and all persons escaped via the return airway. The fire was eventually extinguished by sealing off the roadways to the district involved. The conveyor belt idler set, where flames had originally been seen, was later found to have a collapsed bearing.

### **PART 1**

**In answering the following questions: -**

- state precise statutory references to **Regulations** quoted
  - **précis** the main points of the **Regulations** used
  - state the paragraph number of any **Approved Code of Practice (ACOP)** quoted
  - **précis** the content of the **ACOP** paragraph used
- 
- i) What do **Regulations** require of an employer with respect to the hazards and their risks to health and safety, and what should have occurred before any conveyor is first used or subsequently modified?
  - ii) When designing, planning and installing a conveyor, what do **Regulations** and **ACOPs** require regarding the suitability of work equipment and it's location of use?
  - iii) What do **Regulations** require regarding the health and safety document to be held at the mine with respect to fire?
  - iv) **Regulations** and **ACOPs** specify measures regarding fire precautions in the type of roadway involved. What are these measures?

- v) What do **Regulations** require regarding operating rules, including their implementation and the subjects they relate to, for such events.
- vi) What are the duties of a manager, specified by **Regulations** only, to secure the provision and readiness for immediate use in the case of fire, and what do the **Regulations** state when there is an outbreak or suspected outbreak of fire in a coal mine?

## **PART 2**

**No reference to any legislation is required in this part.**

- vii) Relative to this incident, describe briefly the safety protection that should have been provided and what design and installation changes would have reduced the fire risk.

## **QUESTION A2**

A 350m long face heading for a retreat face had been driven between two completed gate roads. The heading was 4.5m wide, supported by a system of two steel legs set beneath steel bars. This was supplemented by a pattern of rock bolts and longer tendons set in the roof.

In order to install the face equipment, it had been decided to increase the heading width to 7m, utilising additional steel props and bars for support. This work was being performed by contractors, using explosives to excavate the coal and loading it onto the armoured face conveyor that had already been installed in the face heading during drivage.

Midway through the Monday day shift, the materials haulage in the tail gate had become disabled because of haulage engine problems. As a result, when the contractors came on the district on Tuesday day shift, they found that the haulage was still out of action and that the supply of support materials in the district had been used up by the previous shift. They decided to continue working on the heading widening using steel supports removed from the system set in the heading. This decision was taken on site, by the contractors' foreman on the basis that, from his general observation, the heading was adequately supported by the rock bolts.

In order to make progress, the contractors' foreman fired a round of shots as the district official, who had prepared the round for firing, had been called to inspect another district, leaving no-one else available to fire shots. On inspecting the working face after the shots, the foreman discovered that the roof of the face heading had fallen in, completely blocking the roadway. He was unable to contact anyone as communications had not yet been fitted to the armoured conveyor. However, he heard the shouts of two men from the far side of the fall who, unknown to him, had been walking along the heading towards the working area. These men were shocked by the detonation of explosives and subsequent fall so close to them, but were otherwise unhurt except for minor abrasions.

As the official had left the district, there was no-one trained in first aid available to help these men and no-one knew where to find first aid equipment. Therefore they left the district in search of assistance.

The contractors' foreman telephoned the surface control room and reported the fall. He then immediately made arrangements for his team to commence clearing it. The mine manager, upon hearing of the fall and that no-one had been hurt, informed his Managing Director of the incident during a routine telephone conversation later that afternoon. That evening, he was approached by a representative of the mine employees, who had heard rumours of a fall and who wished to visit the site. The manager declined his request on the grounds that no-one had been injured and that arrangements to clear the site were well advanced.

The employees' representative telephoned the Mines Inspectorate at 9.30pm to report the incident. The Mines Inspector thought it necessary to investigate and decided to visit the mine.

**In answering the following questions:**

- State precise statutory references to **Acts and Regulations** quoted
  - **Précis** the main points of the **Acts and Regulations** used
- i** Identify **eighteen (18)** apparent contraventions of Acts and Regulations that the Mines Inspector might have suspected. (Candidates should quote no more than **four (4)** examples from any single **Act** or set of **Regulations**.)
- ii** The Inspector felt that communications between the contracting company and the mine employees should be improved. Give **six (6)** examples of actions that the mine manager might take to improve these communications.

### **QUESTION A3**

At a mine employing 200 men, an auxiliary ventilated, mechanised heading was being driven to access a new seam.

It had reached a distance of 300 metres and was permanently manned by a team of ten men, comprising one official, an electrician, a fitter and seven heading men.

Whilst carrying out a routine inspection close to the head end of the drivage, the official detected in excess of 2% of inflammable gas in the general body of air. He immediately “blew out” his flame safety lamp and suspended all heading operations.

On examination of the delivery end of the ventilation ducting, he noticed a reduction in the ventilation quantity and decided to travel outbye to check the forcing fan. As he left, he shouted to the heading team to carry out a “switchgear move up”.

The switchgear was monorail mounted over an armoured face conveyor, positioned some 30 metres from the head end. The power pack which powered the advancing rams was also mounted on the monorail and was fed from one of the switches. The flexible ventilation ducting was attached to mono-rail bogies and moved forward with the switchgear train, the delivery end of the ducting being some 20 metres in advance of the switchgear.

Almost immediately following commencement of the move up, there was a flash followed by a small explosion.

Subsequent investigations by HM Inspector of Mines revealed, amongst other things, the following:-

- (a) The power pack cable was trapped between a bracket and a damaged lagging sheet, exposing the power cores. This could have been prevented by the fitting of guards and better supervision as the cables moved. A previous repair had been carried out at the point of damage, and copper screening and some core insulation had been omitted.
- (b) The auxiliary ventilation fan had a patent defect, which resulted in the fan impeller slipping on the motor shaft and delivering only two thirds of the quantity of air. The quantity of air was last recorded ten days previously in a book provided by the Manager.
- (c) The mine’s Health and Safety document listed operations requiring the issue of work permits. The operations included the movement of switchgear which had not been complied with in this case.
- (d) There was a lack of any record of the heading with HSE, which hampered the subsequent investigation.

It was concluded that the cause of the explosion was a lack of ventilation, allowing a build up of gas in the heading, which was ignited by a flash from the damaged power pack cable. It was also concluded that had the fan been tested correctly at the manufacturers, the defect would have been found.

**In answering question (i):-**

- State precise statutory references to **Acts and Regulations** quoted
- **Précis** the main points of the **Acts and Regulations** used
- State the paragraph number of any **Approved Code of Practice (ACOP)** quoted
- **Précis** the content of the **ACOP** paragraph used

- i. Outline **sixteen (16)** examples of legal requirements of Sections of **Acts** or **Regulations** which have been apparently contravened in this incident, **including six (6)** examples of the content of **Approved Codes of Practice** supporting the above **Regulations**.

## QUESTION A4

### *PLEASE REFER TO PLAN OF UNDERGROUND WORKINGS AT DONCASTER COLLIERY*

The Plan shows the detail recorded by the Surveyor following an explosion of firedamp that probably originated “in or around” the Main Return Dosco Development. Two belt maintenance men working on the main intake conveyor were killed by the explosion and four other workmen received severe burn injuries. This Dosco had not been working but was partly “stripped down” for maintenance at the point shown. The primary cause of the explosion was still to be established, but the following was known:-

- The two main developments and FO4 were ventilated in series in order to maximise quantities on FO2
- The main return exhaust fan was found to be running at the time of the incident, though it had not been run for 2 days previously following damage caused by an FSV. This had been noted by an Electrician on his Shift Report. The heading had a known make of methane though the Manager was unaware that this fan had been reported as being defective.
- An FSV was found after the explosion, just behind the Return Dosco with its flame trap missing
- 2 workmen from FO4 Installation team and the FSV Driver were also located with the FSV - heavy duty pull-lifts and chains were loaded onto the FSV. All 3 men had received severe burns. One man had a flame lamp.
- The effects of the explosion extended inbye along FO4 Maingate to its faceline, and outbye along the Main Intake Conveyor Road for some 1200 metres, well outbye of FO2 Tailgate.
- The explosion extended up FO2 Maingate for some 200 metres, severely damaging the air crossing and causing a large fall at the junction - Point A.
- The district was extremely dry with poor standards of stonedusting apparent. The coal seam was some 2.2m in thickness.
- There was one mine Official supervising and acting as inspector for the main developments and FO4 Face - he had been in FO4 Tailgate and had been unaware of the workmen seeking lifting equipment with the FSV.
- Due to the poor visibility and the fall of ground, there was some confusion in locating the exits from the district.
- Stonedust barriers were to be found in FO2 Maingate only.

### **In answering the following questions: -**

- state precise statutory references to **Regulations** quoted
- **précis** the main points of the **Regulations** used
- state the paragraph number of any **Approved Code of Practice (ACOP)** quoted
- **précis** the content of the **ACOP** paragraph used

- i When two auxiliary fans are installed in the manner shown, what **two (2) Regulations** must the manager comply with?
- ii Under what circumstances would a **Regulation** permit a workman to enter the Return Development heading whilst the fan is not running?
- iii What section of an **Act**:
  - a) requires the manager to provide adequate ventilation?
  - b) should have been applied by the manager to these circumstances if he had been aware that the fan was not running?
- iv The manager has a duty to ensure that he receives sufficient information through a formal system of reporting. With reference to **ACOP** only, which **ACOP**:
  - a) outlines the reports required and the interval of time when they should be read, and by whom
  - b) deals with defect reports for plant and equipment and action required
- v What do **Regulations** require of the manager with regard to:
  - a) precautions to minimise inflammable dust anywhere underground.
  - b) the frequency of sampling
  - c) how samples are taken so as to be representative.

Reference to **one (1) Regulation** only for each is required.

- vi What **two (2) Regulations**, which if complied with should have restricted the lengths of roadway affected by the “probable” methane gas explosion.
- vii A **Regulation**, supported by an **ACOP**, requires the manager to operate a scheme designed to ensure all persons are able to find their way out from their place of work. Identify and outline the **Regulation** and the **ACOP** concerned to fit the circumstances shown by the Plan.
- viii Without reference to any legislation, list **four (4)** possible sources of ignition of the explosion based upon the information provided.



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**Wednesday, 14<sup>th</sup> June 2006 - 2.00pm - 3.30pm**

**SECTION B**

**(Closed Book) - 'Mining Legislation'**

- **CANDIDATES ARE NOT PERMITTED TO USE ANY BOOKS OR NOTES IN ANSWERING THIS SECTION.**
- This Section carries 40 marks and comprises six questions from which **FOUR (4)** should be attempted.
- **In answering this Section, no reference from the content of any Approved Codes of Practice (ACOPs) is required.**
- In order to pass the Examination, candidates are required to obtain not less than 50% of the marks in each of Section A and Section B.

**Time Allowed: 1 hour 30 minutes**

## **QUESTION B1**

Part 1 of **The Health and Safety at Work etc. Act 1974** refers to the General duties of manufacturers etc as regards articles and substances for use at work.

- i      What are the three (3) duties placed on any person who designs, manufactures, imports or supplies any article for use at work?

**The Management of Health and Safety at Work Regulations 1999** requires an employer to make risk assessments with regard to health and safety.

- ii     What persons should they cover?
- iii    When should they be reviewed?

## **QUESTION B2**

**The Mines (Shaft and Winding) Regulations 1993** place duties on the owner and manager of a mine with respect to the equipment of shaft and inspection, examination and maintenance of shaft and fixtures.

- i What duty is placed on the manager of a mine and what are the requirements of this regulation in order that the manager can demonstrate compliance?

The above **Regulations** also place a duty on the use of shaft or its fixtures.

- ii Who is it placed on and what is the specific duty?

### **QUESTION B3**

**The Mines (Safety of Exits) Regulations 1988** state that it is the duty of a mine owner to ensure that there are at least two shafts or outlets, providing at least two separate exits to the surface.

What do these **Regulations** state with respect to the duties of the manager when one of these two exits is unavailable?

## **QUESTION B4**

**Electricity at Work Regulations 1989** contain provisions that apply to mines only:-

- i Describe each of those requirements associated with records and information

Additionally, the **Regulations** include provisions for both the introduction of battery powered locomotives or vehicles, and the storage and use of traction batteries.

- ii Identify all of the provisions applicable to the introduction and use of battery powered vehicles.

## **QUESTION B5**

**The Coal Mines (Firedamp Drainage) Regulations 1960** apply in part to the safe transport, disposal (or discharge) of firedamp on the surface of a mine.

- i What do the **Regulations** require the manager to ensure with regard to the pipe range installation transporting firedamp from the underground to the surface?
- ii What are the two (2) arrangements in the **Regulations** that the manager must ensure with regard to the installation on the surface of an exhauster for methane drainage?
- iii Provide two (2) precautions laid down in the **Regulations** that the manager must ensure are in place when the discharge point is on the surface or into a utilisation plant.
- iv What are the manager's duties in these **Regulations** with regard to the supervision of exhausters when used for firedamp drainage?

## **QUESTION B6**

**The Provision and Use of Work Equipment Regulations 1998 (PUWER)** requires risks to people's health and safety, from equipment that they use at work, to be prevented and controlled.

- i Briefly outline the basic requirements of every employer, stated in **two (2) Regulations** of PUWER, with regard to the maintenance of work equipment and its inspection.

**The Management and Administration of Safety and Health at Mines Regulations 1993** contains a **Regulation** that specifically refers, amongst other things, to the maintenance and inspection of all plant and equipment at a mine.

- ii What is the basic duty imposed on the mine manager by two parts of this **Regulation**?