THE INSTITUTION OF MATERIALS, MINERALS & MINING THE EXAMINATION IN MINING HEALTH & SAFETY LAW 2007

Wednesday, 13th June 2007 - 10.00am - 12.30pm

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, you may be required to reference more than one set of Regulations and any associated ACOP.

- Candidates are recommended to thoroughly read the scripts and understand the requirements of the questions before answering.

- 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: 2½ hours

SECTION A

QUESTION A1

A new heading was being developed to form the gate road of a retreat longwall face. It was supported solely throughout its length with rock-bolts and mesh and had advanced some 100 metres from the junction with the main intake roadway.

Towards the end of the day shift (11.30 am), the heading team of four men were at the face of the heading installing rock-bolts. At the same time, a number of other tasks were being conducted in the heading.

- A group of six people were working on the previously commissioned conveyor drive and belt structure, and these had been joined by the mine mechanical engineer to discuss problems that they were encountering.
- Three men were laying track.
- Two members of the surveying staff were engaged in setting up the correct line for the heading team.
- Two members of the mine management team had entered the heading to discuss progress with the command supervisor who was at the face of the heading with the rock-bolters.
- A materials supply team of two men had just arrived in the heading and were busy unloading supplies some 30 metres inbye the junction for transhipment to the face.

A fall of the roof and side of the roadway occurred quite suddenly some 15 metres inbye the junction at a point where a small geological fault had crossed the heading. The fall extended for only 5 metres along the roadway, but it was sufficiently severe as to prevent egress from the heading. One of the materials transporters suffered a broken leg at the edge of the fall but was not buried. No-one in the heading was able to locate the first aid equipment in order to treat the injured man.

A team from the adjacent longwall face was summoned and, after three hours, had made a pathway through the fall sufficient to free the trapped personnel. Their work had been hampered because, as the mine was fully mechanised, no hand tools were readily available to clear the fall. The rescuers found it difficult to establish the condition of the trapped men as no communication or signals had yet been installed between the junction and the face of the heading.

The mine manager informed his company Operations Director of the incident during a routine telephone conversation later that afternoon. He informed him that the trapped personnel had been freed. That evening, the manager 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 seriously injured and that arrangements to clear the site were well advanced.

The employee's representative telephoned the Mines Inspectorate at 9.30 pm 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
- state the paragraph number of any **Approved Code of Practice (ACOP)** quoted
- **précis** the content of the **ACOP** paragraph used

i) Identify **fourteen (14)** apparent contraventions of **Acts or Regulations** that the Mines Inspector might have suspected or felt needed closer investigation. (Candidates should quote no more than **four (4)** examples from any single Act or set of Regulations.)

ii) Identify **nine (9)** sections of **Approved Codes of Practice (ACOPs)** that apparently might not have been followed by the mine management.

QUESTION A2

At a safety-lamp mine with 2 man-riding shafts, several persons were involved in an incident while travelling in a shaft cage. One shaft is normally used for mineral winding and the other for men and materials winding.

In the shaft used for men and materials, winding is to the pit bottom approximately 900m from the surface and to a shaft inset some 150m above the pit bottom. The normal mid-shaft maximum winding speed is 10 m/s. The shaft inset is equipped with a pair of large hydraulically operated hinged platforms. Each platform is raised and lowered by a hydraulic ram that incorporates a “kneelock” (over-centre) mechanism, which locks the platform in the raised (shaft clear) position. A single monitoring limit switch proves that the mechanism is kneelocked, and this is connected into the mine winder safety circuit so that if an abnormal condition is detected, the winding apparatus is brought to rest.

Modifications over a weekend period had been made to the mechanism for the platforms which involved the use of new and old items of equipment.

After completing a wind to the shaft inset following the modifications, the shaft onsetter raised the inset platforms, switched off the hydraulic pump used to power the platforms, and travelled to the surface. He noticed that one of the platforms appeared slightly lower than the other as he travelled from the inset. He reported this to the banksman, but as there was no abnormal indication on the shaft monitoring equipment, persons were allowed to enter the cage some 3 hours later and travel to the pit bottom.

As the cage passed the inset at full speed there was a load bang, the cage titled to one side, and passengers were thrown to the floor of the cage. There were more banging, sparks and grinding noises, before the cage came to rest below the inset.

After engineers had assessed the damage, the cage was wound back to the inset some 1.5 hours after the incident. Persons were released from the cage, fortunately with only minor injuries, and travelled to the other shaft via roadways made difficult with restricted height and containing obstructions. Repairs to the cage and shaft equipment took several days.

As the mineral winding shaft had been used for winding persons after the incident, no disruption was caused and the mine was able to continue working normally, and the Health and Safety Executive were informed on the following day.

Subsequent investigations by HM Inspectors revealed amongst other things the following:

1) One inset platform was not fully raised and locked, and slowly lowered back into the shaft when hydraulic power was removed, and presented a significant obstruction to the path of the descending cage.

2) A monitoring limit switch, exposed to airborne mine water, stuck and erroneously indicated that the inset platform was locked in the raised position.

3) Maintenance records were imprecise regarding tests on the monitoring switch and hydraulic circuit.

4) The in-cage communication system was found inadequate and certification details could not be established.

5) The manager's scheme of action, in case of an accident or dangerous occurrence, was not posted in the covered accommodation.

6) The rules for the use of auxiliary apparatus provided for persons to gain exit from the mine were only posted in the winding engine house.

7) The winding ropes have a 4 year life as specified by the manager and were found undamaged.

8) All persons operating the winding system were found to have appropriate training, however, some of the instructions assigning duties were not clear. Appropriate instructions to winding enginemen were posted at the winding engine.

9) Prior planning or report of modifications made at the inset could not be established.

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 **fourteen (14)** examples of legal requirements of Sections of **Acts** or **Regulations** which have been apparently contravened in this incident, **including seven (7)** examples of the content of **Approved Codes of Practice** supporting the above **Regulations.**

ii Describe briefly **four (4)** ways of preventing a recurrence of the incident.

QUESTION A3

At a mine where spontaneous combustion was recognised as a major hazard, an explosion occurred in a 200 metre long drivage which had been left unventilated and not examined for some 30 hours due to a planned re-arrangement of the power supply to the heading.

The roadway, rising at 1 in 20, was 3.5 metres high supported throughout its length on arch girders and lagged with corrugated steel sheets to negotiate a known section of faulted ground. Cavities formed during drivage were filled with timber where possible, and loose debris was allowed to infill behind corrugated steel lagging. Diesel FSVs were used for supplies. A forcing/exhaust overlap auxiliary fan system was in use. Some methane layering had been noted in the "overlap area" at times but always quickly cleared when action was taken.

A re-arrangement of power supply was planned for the weekend, with the environmental monitoring system to be extended into the heading following restoration of power. It was anticipated that the heading would be unventilated for no more than 8 hours. During the last working shift on Friday afternoon, the Official found nothing untoward other than a slightly higher than normal CO reading of 15ppm. He assumed this was due to an FSV which had been in the heading earlier.

Problems encountered with the weekend work resulted in power only being restored to the fan switchgear towards the end of the Sunday morning shift. Due to an absence of Officials, the Senior Official on the surface re-deployed an Official from another part of the mine to examine the heading. His instructions were to "get the fan away before the end of the shift". He had no probe with him, nor made any checks for CO. He noted a paraffin-like smell in the heading but found no more than 0.8% methane in the general body at any point.

An explosion occurred in the heading minutes after he had restarted the forcing fan to ventilate the heading. The flame of the explosion propagated for some distance from the heading before dissipating.

Subsequent investigations showed a spontaneous combustion had developed at the 140 metre point, high up on the roadway side behind the steel sheeting. This probably acted as an ignition source for a methane layer that had formed during the fan stoppage.

In answering the following questions:-

- 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 The Official concerned will have been appointed to the Management Structure by the Manager. What are the **three (3)** principal duties/responsibilities of the Official set out in the **Regulations**?

ii What duties are set out in **Regulations** for the person who inspects any heading at a mine?

iii **ACOP** guidance is provided for those Officials who undertake inspections. Identify and briefly outline **three (3) ACOPs** which provide suitable guidance for the circumstances outlined.

iv What does an **Act** state is the duty of a Manager if ventilation of any section of the mine is inadequate?

v What do **Regulations** require of an owner regarding a health and safety document, and furthermore with respect to explosion and fire?

vi What do **Regulations** require of an employer with regard to “additional Health and safety requirements” concerning such electrical work and precautions to be taken before, during and after completion?

vii What do **Regulations** require of the owner and manager regarding rules for the circumstances and events described?

viii Identify the circumstances stated in **Regulations** which enables a person to start any auxiliary fan.

ix **No reference to any legislation is required**

List **five (5)** examples of bad practice in the heading you may have noted from the circumstances described in the question.

QUESTION A4

During early dayshift maintenance period, two craftsmen electricians were deployed to carry out planned repair work at an outbye conveyor sub-station. The planned works required that internal examinations be carried out on a set of conveyor control equipment used to supply a main trunk conveyor situated in an intake roadway.

During the same period, belt men had been deployed to a routine planned belt joint change that required the joint to be positioned at the maintenance station. The belt men had done this by switching the control mode of the conveyor to local and running the belt to the desired position

Arriving at the substation, the two craftsmen decided to isolate the equipment to be worked on and proceeded to identify the circuit breaker to carry out the isolation. Finding no local circuit breaker they decided to isolate the power at the transformer used to provide the necessary 1100 volt power supply to the switchgear, which was located through a set of ventilation doors some 200 metres away. Both outlets of the transformer were in use and, having tripped the transformer HT breaker, they found that they were unable to fit the necessary padlocks since the isolating mechanism had been damaged.

The necessary repairs were completed and power was restored to the conveyor equipment prior to the belt men completing the joint change.

During his normal inspections, the deputy had found the auxiliary fan, which was used to ventilate a short drivage tunnel being constructed for a new bunker installation, was not running. He checked the gate end box and, finding no power, he proceeded to the local transformer where he found the transformer switched off at the HT switch.

Having completed the belt joint, the belt men proceeded to try the belt and check and make any tracking adjustments. They then left the location without returning the conveyor control to be run and monitored from the surface control room. However, in local control, certain monitoring functions were masked. Specific trip functions were defeated, which left the conveyor without the bearing over-temperature trip facility.

Later that day, an official, on regular patrol inbye smelt smoke and, on investigation, found that a defective jib drum bearing had failed, overheated, and ignited conveyor debris and coal dust in the vicinity of the jib drum. The fire was subsequently extinguished using equipment provided at that location for the purpose.

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. Outline **five (5)** provisions of **Regulations** which may have been contravened with respect to the electrical repairs

ii. Identify **eight (8) ACOPs** to support the **Regulations** described in your answers for (i).

iii. What do **Regulations** require regarding the health and safety document to be held at the mine with respect to fire?

iv. What do **Regulations** require a Manager to secure and provide in readiness for immediate use, in the case of fire?

v. What do the **Regulations** state when there is an outbreak or suspected outbreak of fire in a coal mine?

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Wednesday, 13th June 2007 - 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

The Coal Mines (Precautions against Inflammable Dust) Regulations 1956 set out certain duties for the mine manager.

i What is the basic duty of the mine manager with regard to the maintenance of minimum percentages of incombustible matter in roadways dust?

Ii What are the duties of a mine manager with regard to the provision and maintenance of stone dust barriers?

QUESTION B2

A section of **The Mines and Quarries Act 1954** refers to the making of Transport Rules for the use of vehicles and conveyors.

i Describe the general power granted to a mine manager to make transport rules.

ii What in particular, are the **four (4)** matters that should be included in the transport rules?

A section of **The Mines and Quarries Act 1954** also specifies the safety measures relating to use of vehicles in a mine.

iii Describe the provision and purpose of safety devices referred to in the section.

QUESTION B3

Part 1 of **The Health and Safety at Work etc. Act 1974** refers to the General duties of employers to their employees whilst at work.

i What is the general duty of an employer and what, in particular, are the **five (5)** matters to which that duty extends?

Part 1 of **The Management and Administration of Safety and Health at Mines Regulations 1993** also places duties on employees at work at a mine.

ii What are the duties where an employee at work at the mine discovers that a danger has arisen or is about to arise?

QUESTION B4

Part V of **The Management and Administration of Safety and Health at Mines Regulations 1993** sets out the duties of the Manager with respect to training requirements.

i What are these in relation to the “Appointment of a person to organise training at the mine”?

ii What are the responsibilities of the Manager with regard to a “Scheme of training and supervision”?

QUESTION B5

The Coal Mines (Owner's Operating Rules) Regulations 1993 set out the duties of mine owners and managers with respect to the formation of owner's operating rules suitable for that mine, and their operation.

i What are the subjects for which owner's operating rules shall be made?

ii What is the particular responsibility of the manager under these regulations?

The Mines Miscellaneous Health and Safety Provisions Regulations 1995 requires the owner of a mine to ensure that a Health and Safety Document has been prepared for his mine.

iii What two factors must the document demonstrate?

iv Where appropriate, this document should include four specific plans. What is the subject matter of each of these plans?

QUESTION B6

The **Electricity at Work Regulations 1989** contains provisions that apply to mines only.

i The Regulations place duties where any person detects firedamp in a concentration exceeding 1.25% by volume:

a. Specify where this regulation shall apply

b. What are the specific duties imposed?

c. What actions are subsequently required?

d. Indicate any specific exceptions

ii Describe all of the requirements of the Regulations associated with records and information