

SWAZILAND
FACULTY OF HEALTH SCIENCES
DEGREE IN ENVIRONMENTAL HEALTH SCIENCES
(FINAL EXAMINATION)

TITLE OF PAPER : RISK ASSESSMENT, MANAGEMENT AND
COMMUNICATION

COURSE CODE : EHM 312

TIME : 3HOURS

TOTAL MARKS : 100

INSTRUCTIONS:

- ANSWER ANY FOUR QUESTIONS
- QUESTION ONE IS MULTIPLE CHOICE
- ALL QUESTIONS ARE WORTH 25 MARKS EACH
- NO FORM OF PAPER SHOULD BE BROUGHT IN OR OUT OF THE EXAMINATION ROOM
- BEGIN THE ANSWER TO EACH QUESTION IN A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS EXAMINATION PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

QUESTION 1

Multiple choice: Write True or False against each letter corresponding to the following statements as they apply to acoustics.

- a) Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation.
- b) Risk management is a scientifically based process consisting of hazard identification, hazard characterization, exposure assessment and risk characterization.
- c) Hazard identification is the causal link between agent and effect.
- d) The risk assessment process ensures that factors influencing health are fully understood and adequately quantified so that decisions are taken inconsistently and in a cost-effective manner.
- e) The risk of hearing loss from high noise environments depends on the noise level and the length of time of exposure.
- f) The conduct of occupational hygiene surveys and studies is only one phase in the overall effort in determining occupational health hazards.
- g) Dose-response assessment is the relationship between level and probability of effect.
- h) Improvement in the workplace conditions and increase of illness or disability are due to actions within the workplace and result from the implementation of risk prevention and control measures.
- i) Occupational Exposure Limit (OEL) is the airborne concentration of chemical agents and levels of physical agents and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day with adverse effect.
- j) Epidemiology is a study of how and why diseases are distributed in groups of people and the application of findings to control health problems..
- k) Ergonomics is the science of fitting workplace conditions and job demands to the capabilities of the working population.

ii.

Define prevalence as applied in occupational health

(3 marks)

QUESTION 2

Using the information in the case study below:

- a) Identify high exposure group
- b) Conduct a SHE risk assessment on high exposure group.
- c) Propose controls and measures

(19 marks)

Case study

Siyaphila (PTY) Ltd has a coal mine. The company has a Chief Executive Officer and

10 administrative staff members.

The coal is mined with the use of a continuous miner. Recycled water is used for dust control purposes. One hundred employees climb 10 flights of stairs, with 50 each, covering approximately 3km to the coalface. Supervisors visit 3 similar workplaces a day. Operations managers visit one coalface every week.

Raw coal received from the mine is offloaded by means of a tipper and conveyed to be stored in open bunkers, blending beds and silos. Before the coal is loaded into the ovens it is crushed into smaller particles and sieved into a couple of size fractions by a screening process. Each fraction is sent through various washing and separation processes. 10 workers oversee this process.

The crushed coal is then conveyed from the overhead coal bunkers by conveyer belts to a charging car at the Coke oven to be charged. 2 employees walk up and down the conveyer belt covering 100m every hour. The charging car removes the charge hole covers and dumps the coal into the oven by opening its charge bin gates. Because crushed coal is used the working environment is polluted with coal dust. The oven covers are replaced as the car moves to collect some more coal.

As the ovens are charged vast amounts of smoke and dusts occur. Coke oven and blast furnace gases are used as fuel to heat the coal in the oven. Blast furnace gases contain a high percentage per volume carbon dioxide, carbon monoxide, and nitrogen. 20 operators continuously complain about headaches, fatigue and nausea, irritation of the upper respiratory tract and burning of eyes and noise.

An employee collects gas samples every 30 minutes. He transports the samples to the laboratory where 20 employees are continuously doing qualitative and quantitative analysis on the gases.

At the end of the coking period the pusher machine operator push the coke (cake) with a pusher bar out of the oven. Understandably, large amounts of gas and dust are released during this process. The operator of the guide machine on the opposite side of the oven aligns the guide machine exactly opposite the pusher machine. Two assistants remove the side door to allow the coke to be pushed out of the oven. The quench car, pushed around by the quench loco, collects the coke underneath the oven the ovens and transports the coke to the quench tower, where water is spread over the coke to prevent it from burning. During this process a large quantity of steam, and also fine coke particles, and even organic and inorganic matter may pollute the working environment. During the process a faint smell of rotten egg is noticeable.

The clay running on the same track as the guide machine is used to seal the openings between the doors and the doorframes to prevent gas escaping the ovens. To allow operators to seal the entire door (4m high) the car can lift the operator alongside the door. The cleaning of the doors and frames is essential before it is being replaced to

ensure optimisation of the process.

SHE data

The following SHE data is provided.

Athletes foot	10 case are treated (on average)
Fall of ground	8 incidences per year with an average fatality rate of 10 per annum
Hand injuries	360 minor hand injuries are recorded
Dermatitis	4 laboratory employees suffer from an allergy due to the use of latex gloves.
Ergonomics	3 employees (weighing 110kg and are 2.0 m tall) working on the continuous miner continuously complain about backaches
Airflow	At face is 0.5 m/s Within silos 10 – 15 m/s
Heat survey	An average of 29.5 degrees Celsius recorded on top of the Coke ovens during the months of June, July and August.
Noise survey	Personal noise exposure at the face, a Leq of 110dB(A) Personal noise exposure at the screens, an average Leq of 95 dB(A)
General	The administrative staff visits the clinic on a regular basis complaining of headaches and fatigue
TB	The prevalence rate for TB is 20%
HIV/AIDS	10% of the workforce, primarily the miners suffer from HIV/AIDS

Existing control procedures

All employees are supplied with:

- Hard hats
- Safety shoes
- 2 sets of overalls
- Vibraphones

All employees are subjected to:

- Medical examination tests including a physical examination and audiometric tests as well as X-Rays and lung function tests.

- An induction programme, which inter alia covers the hazards, and risks associated with the work being conducted.

d) Define occupational health (3 marks)

e) Define occupational health services (3 marks)

QUESTION 3

a) Describe air-borne pollutants and give one example of each and stipulate its source and an occupational health problem or disease associated with it. (10 marks)

b) Describe a health and safety risk management framework (15 marks)

QUESTION 4

Describe the hazard substances management procedures under the following headings;

a) Material Safety Data Sheets (MSDSs) (8 marks)

b) Receipt of chemical products on site (5 marks)

c) Storage facilities (9 marks)

d) Sampling (3 marks)

QUESTION 5

a) Describe the requirements of a valid measurement as applied in occupational hygiene. (6 marks)

b) Describe the elements of an effective occupation health management policy. (6 marks)

c) Describe the purpose of an occupational health assessment (10 marks)

d) Describe risk communication (3 marks)

APPENDIX 1

Consequence			
Catastrophic (10% mortalities)	10% mortalities or damage > E10m	P: mortality recorded: E: Large irreversible impact	100
Disaster (5% mortalities)	5% mortalities or damage > E5m	P: mortality possible: E: moderate irreversible impact	40
Very serious (1% mortalities)	1% mortalities or damage > E1m	P: mortality unusual: E: minor irreversible impact	15
Serious (10% permanent illness)	10% permanent disabilities or damage > E0.5m	P: permanent disability recorded: E: large irreversible impact	7
Serious (5% permanent illness)	5% permanent disabilities or damage > E0.1m	P: permanent disability possible: E: moderate irreversible impact	6
Serious (1% permanent illness)	1% permanent disabilities or damage > E 20 000	P: permanent disability unusual: E: minor irreversible impact	5
Serious (10% temporary illness)	10% temporary disabilities or damage > E 10 000	P: temporary disability recorded: E: large controlled release	4
Serious (5% temporary illness)	5% temporary disabilities or damage > E 5 000	P: temporary disability possible: E: moderate controlled release	3
Serious (1% temporary illness)	1% temporary disabilities or damage > E 2 000	P: temporary disability unusual: E: minimal controlled release	2
Of concern (10% minor illness)	(10% minor disabilities or damage > E 1 000	P: complaint recorded: E: large nuisance	1
Of concern (5% minor illness)	(5% minor disabilities or damage > E 500	P: complaint possible: E: moderate nuisance	0.5
Of concern (1% minor illness)	(1% minor disabilities or damage > E 200	P: complaint unusual: E: minor nuisance	0.1

P = Public, E = Entertainment

Calculation	Classification	Action
400 and above	Eliminate	Consider to discontinue
250-399	Very high risk	Immediate correction required
150-249	High risk	Correction needed

70-149

Medium risk

Indicate attention necessary

20-69

Low risk

Little attention necessary

Table 2: Risk classification

**QUANTITATIVE AND QUALITATIVE RISK ASSESSMENT
EXPOSURE**

- Continuous for 8 hour shift (10)
- Continuous for between 2 and 4 hours (6)
- Continuous for between 1 and 2 hours (3)
- Short periods of time (a few times per month) (2)
- Unusual (a few times per year) (1)
- Rare (yearly) (0.5)
- Exceptionally exposed (0.1)

PROBABILITY OF EXCEEDING OEL

- Exceeding OEL-C (10)
- Exceeding OEL-STEL (6)
- Exceeding OEL-TWA (3)
- Exceeding action level (50% of TWA) (1)
- Exceeding 25% of TWA (0.5)
- Exceeding 10% of TWA (0.2)
- Virtually impossible (approaches the impossible) (0.1)