PROBLEMS ENCOUNTERED BY FOSKOR MINE WORKERS WITH THE USE OF PERSONAL PROTECTIVE EQUIPMENT

by

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for the degree of

MASTER OF ARTS

in the subject

Health Studies

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF SM MOGOTLANE

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DECLARATION

I declare that PROBLEMS ENCOUNTERED BY FOSKOR MINE WORKERS WITH THE USE OF PERSONAL PROTECTIVE EQUIPMENT is my own work and that all sources that I have used or quoted have been indicated and acknowledged by means of complete references.

SIGNATURE
(ML PILUSA)

DATE
The purpose of this study was to find out problems encountered by Foskor Mine workers in Phalaborwa with the use of personal protective equipment and also to find out how these problems can be prevented or solved. A quantitative research study was done using a questionnaire as a data gathering tool on workers who are exposed to occupational injuries and illnesses and who use personal protective equipment for their protection. The findings revealed that even though workers were using personal protective equipment they still got occupational injuries and illnesses. They also had problems with their protective equipment like incompatible types of personal protective equipment, such as weight where heavy personal protective equipment like boots were issued and very hot or cold personal protective equipment incompatible with the temperature of the environment. Some personal protective equipment like gloves were of a wrong size and caused allergy. In some instances unavailability of or unsuitable personal protective equipment posed challenges to these workers.

**KEY CONCEPTS**

Foskor Mine worker; occupational illnesses; occupational injuries; personal protective equipment.
ACKNOWLEDGEMENTS

I would like to thank and express my appreciation to the following:

- To God, who gave me health and strength to be able to finish this dissertation.
- My wife, Thokozile Catherine, for her encouragement in my studies.
- My children, Kedibone, Thabo, Nthabiseng and Lebogang, for their inspiration.
- My supervisor, Prof SM Mogotlane, for her dedication, support, encouragement and patient guidance with my dissertation.
- My colleagues at Clinix Health Services (Foskor Mine) for their support.
- Dr P Moroa, for his constructive criticism of my work.
- Ms E Quin, for typing my work.
- Foskor Mine management for giving me permission to conduct study.
Dedication

I dedicate this dissertation to my father, the late Moses Phillip, my mother Mapula Sophie Pilusa and my first nursing tutor, Ms Annedah Malatjie.
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<td>NIHL</td>
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<td>P0₄</td>
<td>Combination of phosphorus and oxygen to form orthophosphate</td>
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<td>PPE</td>
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<td>SPSS</td>
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<td>Z₁O₂</td>
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Chapter 5

Conclusion, recommendations and limitations of the study

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<td>ABET</td>
<td>Adult-based education and training</td>
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<td>NIHL</td>
<td>Noise-induced hearing loss</td>
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<tr>
<td>P04</td>
<td>Combination of phosphorus and oxygen to form orthophosphate</td>
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<tr>
<td>PPE</td>
<td>Personal protective equipment</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>Z1O2</td>
<td>Zirconium dioxide</td>
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CHAPTER 1

Orientation to the study

1.1 INTRODUCTION

Foskor is a single phosphate mine that was established in 1951. Since then it has transformed into one of the world’s leading mines for phosphate rock and producer of phosphate, phosphoric acid and a number of secondary acid and mineral products that are in high demand around the world. According to the *Free Dictionary* (2008), phosphate refers to a salt or ester of phosphoric acid, containing the combination of phosphorus and oxygen to form orthophosphate ($\text{PO}_4$). Phosphates are frequently used in fertilizers.

The mine has two main units, Foskor Phalaborwa, which is situated in the Limpopo Province of South Africa near the town of Phalaborwa and Foskor Richards Bay, which is situated in KwaZulu-Natal Province, South Africa.

The Phalaborwa region of Limpopo Province boasts extensive phosphate and copper reserves and Foskor Phalaborwa focuses on the mining and beneficiation of this phosphate rock as well as recovering low concentrates of copper minerals.

Copper is a malleable, reddish-brown metallic element that is a good conductor of electricity and heat. It is obtained by mining ores such as chalcopyrite and is used in the wiring and coatings of electric cables and in the manufacture of alloys (*MSN Encarta Dictionary* 2008).

Foskor Rock and Copper operate an open cast mine that extracts phosphate rock and ore at a rate of 11 million tons per annum. The process involves crushing, grinding and desliming the ore, much of which is then transferred by rail to the Foskor Richards Bay plant for processing. Low concentrates of copper minerals are also extracted through this extraction process and this generates a further, secondary income for the organisation. A further activity includes the mining of Zirconia.
According to *Wikipedia, the Free Encyclopaedia* (2008), zirconia is scientifically known as Zirconium dioxide (ZrO₂). It is a white crystalline oxide of zirconium. Its most naturally occurring form, with a monoclinic crystalline structure, is the rare mineral, baddeleyite. The high temperature cubic crystalline form, called 'cubic zirconia', is rarely, if ever, found in nature, but is synthesized in various colours for use as a gemstone. The cubic crystal structured variety cubic zirconia is the best-known diamond simulant.

The second business unit of Foskor is Foskor Richards Bay, KwaZulu-Natal Province, South Africa. The Richard’s Bay plant is primarily a producer of phosphoric acid and phosphate-based fertilizers. It is also responsible for the distribution of sulphuric acid (Foskor 2008).

The study was conducted in the Phalaborwa unit. Like any mining facility, Foskor Phalaborwa, is a working environment where there is a continuous and potential risk of occupational injuries and diseases to its workforce. In an effort to prevent, or at least minimise, occupational injuries and occupational diseases, all exposed Foskor workers are required to make use of personal protective equipment (PPE).

The use of personal protective equipment is a universal and legal requirement to protect workers against occupational injuries and illnesses in their workplace. These personalised items are very useful, as without them, workers could be exposed to a variety of toxic substances, chemicals, radiation, or incidents, which could result in occupational diseases, injuries, or even fatalities.

Examples of occupational diseases and injuries that could occur if workers do not correctly use the personal protective equipment issued to them include:

- **silicosis** – from silica if dust masks or some form of respirator are not used (Rom 1998:446)
- **dermatitis** – from direct contact with chemicals if PPEs are not used correctly (Hattingh & Accut 2003:194-195)
- **mechanical injuries** – for example head injuries, or direct injuries to other parts of the body, if hard hats, adequate gloves or safety boots and many other types of PPE are not worn
• noise induced hearing loss – if workers persist to work in a noisy area in excess of noise at a level of 85dB (A) at a distance of one meter without wearing earmuffs or earplugs (Hattingh & Accut 2003:197)

Although personal protective equipment is very useful to workers in protecting their health, some workers encounter problems in the regular and correct use of it. In other instances employers do not provide the PPE as is legally required. The purpose of this study, then, is to identify the problems that workers encounter in the use of PPE at Foskor Mine in Phalaborwa, Limpopo, South Africa.

1.2 BACKGROUND TO THIS RESEARCH

There are basically three ways of preventing injuries and occurrence of occupational diseases among workers:

• The first is to remove the cause of the occupational injury or illness.
• The second is through engineering revision that includes improvement to the guarding of machines and tools in the work environment by qualified and authorised persons.
• Lastly, it is the revision of work processes and procedures through participation of all concerned and with the consent of management (Hattingh & Accut 2003:107).

If the first two preventive measures mentioned above do not work, that is, removing the cause of the occupational injury or illness and engineering revision, then the use of PPE becomes essential. This is, then, a final resort towards protecting workers against occupational injuries and/or illnesses and is also in line with the Mine Health and Safety Act (Act No 29 of 1996) (South Africa (Republic) 1996).

Since personal protective equipment has to be used on a regular and daily basis, they sometimes pose problems to workers. According to Guild, Ehrlich, Johnston and Ross (2001:425) various problems that workers encounter in their daily use of personal protective equipment are listed as:
“… uncomfortable, and of improper size or have communication problems. Workers will often remove their hearing protectors or loosen them so that they can communicate with each other, hear warning signs or the sound of the machines”.

This view is supported by Hattingh and Accut (2003:115) where they state that the excuses of many workers for not wearing PPE are, amongst others, discomfort, interference with the performance of tasks and that it is too much trouble to put them on and take them off. This activity becomes very cumbersome, especially if the PPE needs to be taken off and put back on, several times during a working shift.

One of the important measures to enforce the correct and regular use of PPE is legislation. South Africa has applicable legislation that deals specifically with the use of personal protective equipment. The Mine Health and Safety Act, 1996 (Act No 29 of 1996), (hereinafter referred to as the Act) places responsibilities on both the employer and the employee as far as the use of PPE is concerned.

The legal responsibilities referred to above are discussed below:

**Responsibilities of the employer, in terms of section 6 of the Act**

According to the Mine Health and Safety Act (Act no 29 of 1996) it is the responsibility of the employer to ensure an adequate supply of health and safety equipment that entails:

- supplying all necessary health and safety equipment and facilities to each employee
- maintaining the equipment and facilities in serviceable and hygienic condition
- ensuring that adequate quantity of PPE are available to each employee as required
- ensuring instruction of workers in the proper use, the limitation and the appropriate maintenance of the equipment
Responsibilities of employees in terms of section 22 of the Act

According to the stipulations of the Act, employees are responsible to use, and take proper care of protective clothing and other health and safety equipment provided to them by the employer.

1.3 PROBLEM STATEMENT

To be protected against occupational injuries and illnesses that they are exposed to in their workplace, mine workers use PPE that is supplied to them by their employers. Although these PPE help to protect employees against work related injuries and illnesses, the researcher observed that employees were reluctant to spontaneously use these. The researcher also observed that there were still some limitations in the PPE protecting workers as some workers still suffered injuries and illnesses even while using PPE. On talking to employees, there was also a feeling that workers encounter problems in their daily use of PPE, for example, discomfort as a result of poor fit and suitability in relation to environment. A study was then planned to explore these concerns.

1.4 SIGNIFICANCE OF THIS STUDY

According to literature, there is very little research that has been conducted on the actual problems and experiences encountered by workers with the use of PPE. This study intends to make a contribution in this regard by exploring the problems encountered by workers at Foskor Mine in Phalaborwa and also to highlight the reasons why workers do not make effective use of the PPE issued to them with a view of providing intervention measures in this regard.

The significance of this study is supported by Hattingh and Accut (2003:115) when they state that:

“... one example of how such an investigation bore fruit was that workers found that it was difficult to wear eye protection (goggles) because of the misting effect, which caused limited vision and considerable discomfort. After thorough research, goggles
were designed that could resist misting. A simple procedure but with tremendous positive results – the potential for serious and often fatal eye injuries was excluded.”

1.5 PURPOSE AND OBJECTIVES OF THE STUDY

The purpose for this study was to determine the problems that workers encounter in their daily use of personal protective equipment. The objectives of the study were to

- establish problems encountered by workers at Foskor Mine in Phalaborwa in the use of personal protective equipment
- determine whether workers knew the importance for using personal protective equipment
- make recommendations on how to prevent or deal with problems encountered by Foskor Mine workers in Phalaborwa in the use of personal protective equipment, based on the data collected

1.6 DEFINITION OF CONCEPTS

In this study the following words and/or phrases had the following meaning ascribed to them unless the text indicates otherwise.

*Foskor Phalaborwa worker*. A Foskor Phalaborwa worker is any individual who is either employed directly by Foskor Phalaborwa or contracted to Foskor Phalaborwa and who receives a salary for the work performed by him/her.

*Workplace* refers to any working area at Foskor Phalaborwa, an open cast mine where phosphate and Zirconia are mined.

*Personal protective equipment (PPE)*. This is any equipment, e.g. hard hats, boots, gloves, masks, respirators, overalls or earplugs that are issued to workers and are to be worn by them to protect them against occupational injuries and illnesses at the workplace.
1.7 RESEARCH METHODOLOGY

1.7.1 Research design

A non-experimental explorative and descriptive, quantitative design was used for this study to provide an explicit description of the problems mine workers had in the use of PPE especially in Foskor Mine in Phalaborwa.

1.7.2 Population of the study

The population of a study can be defined as that group of people, items, objects or elements who meet the designated set of criteria for the study and about whom one wants to draw a conclusion or conclusions (Babbie & Mouton 2003:100). A population forms a pool from which a sample is selected. In research there are two types of population, accessible population and target population. Accessible population is the aggregate of cases that conform to the criteria as stated while the target population is that group of people, cases, objects or elements from whom generalizations can be made. In this study the target population was all the Foskor Mine workers, including contractors who make use of PPE while on duty. The population for this study is fully described in chapter 3 of this dissertation.

1.7.3 Sampling technique used for this study

According to Gay (1992:123), sampling is a process of selecting a number of individuals from a study population in such a way that those selected are representative of the larger group from which they are selected. There are two techniques of sampling, the probability and non-probability sampling techniques. In this study a non-probability convenience sampling was used to select a sample of mine workers including contract workers from the population who participated in the study. The sampling technique is discussed in chapter 3 of this text.
1.7.4 Data collection

Data was collected by means of a questionnaire designed by the researcher. A questionnaire according to Seaman (1987:435) is an instrument and a technique of collecting data by means of written questions that the subjects answer in writing, with little (if any) help from the researcher.

A questionnaire which was written in English was given to 65 respondents who were conveniently sampled by the researcher. All the questions on the questionnaire were fully explained to the respondents. It was explained to the respondents that they had to respond to the questionnaire in their own time, and were requested to please return the completed questionnaires to the researcher by a given date.

To ensure anonymity the respondents were requested not to write their names on the questionnaire or to make any mark or any other form of writing which may identify the person who completed the questionnaire. It was also emphasised to respondents that they took part in the study at their own free will, and that they had the right not to take part or to withdraw at any stage and their action will not prejudice their employment in the mine or anywhere else. The issue of informed consent is fully described in chapter 3 of this dissertation.

1.7.5 The concept of validity

Validity is defined by Johnson and Christensen (2004:140) as the accuracy of the inference, interpretation or actions made on the basis of test scores, while Leedy (1993:40) explains that validity is concerned with the soundness and the effectiveness of the measuring instrument.

To ensure internal validity, all respondents used the same questionnaire. A pre-test of the instrument was also done to ensure construct validity, whereupon five occupational nurses were asked to respond to the questionnaire to ensure that it measured what was intended. A pre-test of the instrument used in this study is described in chapter 3 of this text.
1.7.6 The concept of reliability

Reliability is the consistency with which a measuring instrument yields a certain/similar result when the entity measured hasn’t changed (Leedy & Ormond 2005:29). More detailed information on how reliability was ensured in this study will be provided in chapter 3.

1.7.7 Ethical considerations

Informed consent (see annexure 2) was obtained from all respondents in this study, following detailed information about the purpose, aims and objectives of the study. This was done to ensure that all respondents who participated were aware and willing to be involved in the study. The proposal to conduct this study was presented and approved by the research committee in the Department of Health Studies at the University of South Africa. Permission was also sought and received to conduct the study from the management of Foskor Mine Phalaborwa.

A copy of a letter of request, which states the purpose of the research and the fact that it forms part of a requirement for the researcher’s Master’s Degree in Health Studies, is included as annexure 3. Another copy of the letter granting permission to conduct the research is also included as annexure 4.

1.7.8 Analysis of data

Analysis of quantitative data has been done using the SSMstatistical Package for Social Sciences (SPSS) 13.0 computer program. Descriptive and inferential statistics was also used in the data analysis and summaries included graphs, chi-square, lists and descriptions related to problems in the use of PPE (Brink 2002:179).

1.8 LIMITATIONS OF THE STUDY

Since the research was conducted on Foskor Phalaborwa mine workers only, results could not be generalised; but the study could be replicated in other mines. Another limitation was that of using self reported questionnaires which excluded employees who could not read and/or write.
1.9 STRUCTURE OF THE DISSERTATION

This study consists of five chapters:

Chapter 1  Introduction and outline of the research

Chapter 2  Literature review

Chapter 3  Research design and methodology

Chapter 4  Presentation and analysis of data

Chapter 5  Conclusion and recommendations of the study

1.10 CONCLUSION

Chapter 1 introduced the research study on problems encountered by Foskor Phalaborwa Mine workers in the use of PPE. The main purpose of this research is to identify problems encountered by Foskor Phalaborwa Mine workers while using PPE, in an effort to try to prevent or solve these problems. In chapter 2 a review of the literature will be provided.
CHAPTER 2

Literature review

2.1 INTRODUCTION

Chapter 1 introduced the study and presented the layout of the planned study, as well as the reasons why the study was conducted. In this chapter a review of the available literature will be provided. This will cover information provided by other authors about the problems that workers encounter in their daily use of PPE at their workplace.

The literature review will also cover different types of PPE and legislation that deals with PPE.

2.2 LEGISLATION THAT DEAL WITH PPE

According to Safe and Healthy Working (2007), the Personal Protective Equipment at work Regulation states that where risks cannot be controlled by any other means, PPE should be correctly selected and used, in order to protect workers. This regulation also has specific requirement for the provision, maintenance and use of PPE. Under the general requirement of the Health and Safety at Work Act, employees cannot be charged for the provision or maintenance of PPE.

A Guide to Personal Protective Equipment (2008) states that the PPE Regulation together with the Heath and Safety at Work Regulation of 1992 regulates that the employer has an overall duty to ensure the safety of employees, visitors and others at the workplace. Providing PPE wherever health and safety risks are not adequately controlled at work can ensure this.

The Regulation of the Safety and Health Administration as reviewed in New York Committee for Occupational Safety and Health (2007), states that the employer must ensure that:
PPE used is the right one for the job that is done.
- PPE is always maintained correctly.
- PPE that is provided adequately protects the employee.
- PPE issued fits the employee properly.
- PPE issued is not defective.
- Employees are trained so that they know which PPE is necessary and when PPE is necessary.
- Employees are trained on how to put PPE on and off.
- Employees are trained on how to dispose of PPE.

The Mine Health and Safety Act (Act no 29 of 1996) states that the employer must supply PPE to the employees, and also maintain it free of charge (South Africa (Republic) 1996).

2.3 DIFFERENT TYPES OF PERSONAL PROTECTIVE EQUIPMENT (PPE) USED IN THE MINES AND PROBLEMS THAT WORKERS ENCOUNTER WHEN USING THESE

There is quite a multitude of PPE used on the mines. The mining industry is known as a heavy industry with many potential unsafe areas as well as risk areas where incidents could occur that may negatively impact on the health and safety of workers. It is, therefore, understandable that a variety of PPE would be in use in the mine.

2.3.1 Hearing PPE

Our ears never sleep. We can’t turn them off – not even when we are asleep. Everyday we are exposed to a world of sounds. Our ears, therefore, need to work very accurately for us to be able to be oriented and protected from harm. The importance of one’s sense of hearing often only becomes evident, when one has lost it. However, being aware of this can be the first step towards prevention of noise induced hearing loss.

Most people are unaware of the presence of environmental sound at damaging levels, or of the level at which sound becomes harmful. According to Phonak (2008), common sources of damaging noise levels include a variety of environmental sources which very often are not even thought of as sources of unwanted sound. Examples include: car...
stereos, children’s toys, transportation, crowds, lawnmowers and maintenance equipment, power tools, gun sound, hair dryers, and other forms of noise which we encounter in our general day to day activities.

Noise damage is cumulative. If one is exposed to loud sound (including music) at high levels, 85 dB (A) and above for extended periods, the potential of hearing impairment is increased. Sound levels increase with proximity; as the source is brought closer to the ear, the sound level increases. This is why music is more likely to cause damage at the same output when listened to through headphones, as the headphones are in closer proximity to the ear drum than a loudspeaker (ibid).

Everyday, we experience sound in our environment, such as the sounds from television and radio, household appliances, and traffic. Normally, we hear these sounds at safe levels that do not affect our hearing. However, when we are exposed to harmful noise – sound that is too loud and last a long time, especially as is found within the mining industry – sensitive structures in the inner ear can be damaged, causing noise-induced hearing loss (NIHL). These sensitive structures, called hair cells, are small sensory cells in the inner ear that convert sound energy into electrical signals that travel to the brain to interpret sound into words. Once damaged, the hair cells are irreparable (National Institute on Deafness and other Common Disorders 2008).

NIHL can be caused by a one-time exposure to an intense “impulse” sound, such as an explosion, or by continuous exposure to loud sounds over an extended period of time, such as noise generated in a woodwork shop with machine that polish wood. The loudness of sound is measured in units called decibels. For example, the humming of a refrigerator is 40 dB (A), normal conversation is approximately 60 dB (A), and city traffic noise can be 85 dB (A) or higher. Sources of noise that can cause NIHL include motorcycles, firecrackers and small firearms, all emitting sounds from 120 to 150 dB (A). Long or repeated exposure to sounds at or above 85 dB (A) can cause hearing loss. The louder the sound, the shorter the time period before NIHL can occur. Sounds of less than 75 dB (A), even after long exposure, are unlikely to cause hearing loss (ibid).

Approaching NIHL may be suspected when sounds become distorted or muffled and it may also be difficult for the person to understand speech. Someone with NIHL may not
even be aware of the loss (National Institute on Deafness and other Common Disorders 2008).

Good hearing facilitates spatial orientation and the perception of life-saving sounds (i.e. in traffic and at work). How often does it happen that one hears an approaching car or other form of danger before one even sees it? Phonak (2008) emphasizes a need for two well functional ears to judge the distance of the source of the sound and determine its precise direction.

Hearing gives one access to the world of spoken language and, therefore, communication with other people. It is the key to social relationships and activities, where hearing slight nuances is of utmost importance, because when communicating, it is not only the words themselves that count but also intonation, volume, etc. What if we could not perceive these subtle details when communicating?

Being hard of hearing can lead to a significant reduction in the quality of life, especially in terms of social contacts and mental well-being. According to Phonak (2008) hearing impaired people who do not wear a hearing instrument suffer more often and more violently from the following:

- Sadness
- Fear and anxiety
- Reduced social activity
- Emotional instability and insecurity
- Concentration problems
- Fatigue and exhaustion
- Headache and muscle pain
- Vertigo
- Stress and high blood pressure
- Eating and sleeping disorders
- Stomach problems

Hearing protection, therefore, is an essential part of protecting the health and safety of workers. The Environmental Health and Public Safety Centre (2008), North Carolina
State University states that where engineering and administrative controls are not successful in lowering noise exposure, hearing protection devices must be used.

**Types of hearing protection devices**

There’s a wide variety of types of hearing protectors available, including ear muffs, foam and preformed ear plugs, and canal caps. The following are examples of different types of hearing protectors, selection of which is based upon several factors, as described below (ibid):

- **Ear muffs.** These devices fit against the head and enclose the entire external ear. The inside of the muff cup is lined with acoustic foam, which can reduce noise, by as much as 15 to 30 decibels. Earmuffs are often used in conjunction with earplugs to protect the employee from extremely loud noises, usually at or above 105 dB (A).

- **Ear plugs.** Preformed ear plugs come in different sizes to fit different sizes of ear canals. Formable or foam ear plugs, if placed in the ear correctly, will expand to fill the ear canal and seal against the walls. The expansion allows foam ear plugs to fit ear canals of different sizes.

- **Canal caps.** As the name implies, these devices cap off the ear canal at its opening. They generally provide less protection than ear muffs or plugs, because the fit is usually not so perfect.

Choosing the right hearing protector depends upon several factors *(ibid)*:

- **Good seal.** Sound reduction is dependant upon blocking any air leakage which will allow sound to bypass the hearing protector and enter the ear. For this reason, the hearing protector must fit properly whether over the ear or in the ear.

- **Comfort.** Both comfort and convenience is important if the device is to be used consistently. The ease of placing and removing the device, as well as environmental factors such as the presence of dirt or chemicals must be considered.
• **Communication.** Hearing protectors often make communication difficult by reducing and distorting sounds. Employees who have hearing-impairment, may, depending on the degree of impairment, prefer a detailed face to face instruction or ear muffs because these are easy to lift to effect communication.

**Care and maintenance of hearing protection devices**

Ear plugs must be replaced on a daily basis or whenever they become soiled. Using an unclean ear plug may lead to an ear infection. Employees should be issued with their own earmuffs which are cleaned and sterilized frequently. For cleaning, ear muffs should be wiped off or washed with soap and water. Ear muffs should be inspected regularly for signs of wear and tear, and should defects appear, these devices should be replaced (*ibid*).

Overprotection of the ear by the use of PPE can cause problems to the worker. The worker could fail to hear signals like alarms that could be warning him of imminent danger. The worker could also fail to hear sounds from low noise vehicles such as forklifts (Parker Merchanting 2007).

**Problems encountered with hearing protection devices**

According to Guild et al (2001:434), there are problems that workers encounter with the use of ear protecting PPE. It is reported in NIOSH: A Practical Guide for Preventing Hearing Loss (2007) that because of too much attenuation caused by earplugs, some workers do not insert these earplugs deeply. This, they do, because the deeper the earplugs are inserted, the more they cannot hear speech when they communicate with colleagues.

The US Department of Health and Human Services (2008), states that the problem with hearing protectors is that:

• They slip or become loose over a period of time. This results in PPE, which need to be readjusted from time to time as it is ineffective if it is loose.
• They sometimes break or become worn out and therefore need to be replaced or repaired.
• Faulty fit of hearing protectors can lead to little or no effect on protection of the workers hearing mechanism.
• Removal of a hearing protector even if it is for a few minutes can have a dramatic negative effect on the workers hearing.
• Some ear-protecting PPE may be incompatible with other protecting devices, for example hard hats, or goggles.
• A person’s ears are not of the same size, therefore when fitting hearing protectors; attention needs to be given to each ear. Earplugs should therefore be separately fitted for each ear.
• If a worker is having physical problems like ear infection or excessive wax, the condition can be made worse by the use of ear PPE. A worker who is having an ear infection will be unable to use PPE such as earplugs.
• It is difficult for some workers to wear earmuffs, because of the difference in the shape and size of their head. The different shape and size of the ear canals can also pose a challenge in the use of certain earplugs.

Some dirt or any other chemical contamination, according to Schoeman and Schroder (1994:38), can lead to irritation or/and inflammation of the workers ear, which can become worse with simultaneous use of earplugs.

Other problems encountered include:

• Workers who already have noise-induced hearing loss. These workers find it very hard to hear warning sounds or even to communicate with their co-workers resulting in them loosening their protectors so that they can be able to hear. This result in workers continuing to loose more hearing due to continuous exposure to noise.
• Faulty insertion, where workers have not been trained on how to wear or insert hearing protection devices and these are inserted inappropriately resulting in leaks.
• Attenuation leaks, where, because of wear and tear, earplugs become less flexible and no longer moulding to fit snugly into the ear canal, resulting in leaks.
or the ear-muffs headbands loosing their tension and no longer conforming to the head, resulting in attenuation leaks.

2.3.2 Head PPE

According to the National Library of Medicine (2008), millions of people sustain head and brain injuries through blows and pressure on the head. Some are minor because the skull is quite good at protecting the brain. More than half are bad enough that people may need to go to hospital. Serious head injuries can lead to permanent brain damage or death. It, therefore, becomes important to protect workers against these head injuries which are sometimes fatal or life threatening.

Head injuries are common in the mining setup due to the types of activities that take place on a daily basis. These head injuries can be caused by activities such as falling objects including rocks, spillages and debris from conveyer belts, electric shock hazards and head-bumping (Adams, Du Plessis, Gumbie & Willis 2007:199). Head injuries can result in the mine losing experienced workers, or the mine having to pay a lot of money in insurance payouts.

To avoid these head injuries, head protecting PPE has to be used at all times when performing duties that could expose the worker to any possible type of head injuries. This includes all workers working in opencast or underground mines.

Types of head protection devices

Head protection PPE includes a variety of hard hats. These protect the wearer against falling objects, bumps, and knocks against stationary or moving objects. Also included in this category of PPE are hair nets which help prevent entanglement of the hair on especially moving or spinning machines or equipment.

To ensure that head PPE is always effective, the following should be done:

- Ensure that the hard hat has a headband that can be used to secure it on the head.
- Never use a hard hat with a perished headband.
- Never use balaclavas underneath hard hats.
- Never use a hard hat with a cracked shell.
- Never use petrol, paint, aerosol sprays or such cleaning agents to clean hard hats as these can damage it (Adams et al 2007:200).

**Care and maintenance of head PPE**

Always examine the hard hat for any signs of cracks, dents or any form of damage. Any unauthorised alterations are not allowed as these may render the safety of the hard hat ineffective. Damaged helmets should never be used.

**Problems encountered with head PPE**

According to Abeysekera (2007), industrial helmets do not have facilities to unlock and remove the helmet in a hurry in an emergency. This can pose a problem to the worker if the helmet gets hooked onto something. The other reported problem is that head PPE is very uncomfortable to wear as it does not adjust to changing temperatures. It may therefore, becomes very hot to wear a helmet or hard hat even if the heat is as low as 16°C only becoming worse if it is very hot. On the other hand some may become too cold in cold weather, depending on its make. Some head-protecting PPE might not be compatible with the eye, hearing and respiratory PPE.

The US Department of Labor (2007) indicates that a head PPE that does not fit properly, because of it being too large or too small, is inappropriate for use as it does not serve the purpose.

**2.3.3 Eye PPE**

Workplace injuries are a leading cause of eye trauma, vision loss and disability. In order to reduce the number of eye injuries proper PPE should be used as well as improvement of workplace conditions. To highlight the seriousness of these eye injuries, 2,000 workers are treated for work-related eye injuries daily, with annual injuries totalling 80,000 (US Department of Health and Human Services 2007).
Although eyesight enables us to avoid most visible hazards around us, our eyes are exposed to dangers that may be caused by airborne dust, sand particles, shavings that may come off during machining processes, filings due to grinding, lasers, infrared or UV radiation amongst others (Adams et al 2007:200-201). Our eyes, according to Guild et al (2001:430), can also be damaged by the impact of small and heavy particles that can be projected at either a low or high velocity, contact of the eye with irritating gases or vapours, splashing of hot or corrosive liquids and a beam of electromagnetic radiation including laser beams.

**Types of eye protection devices**

The mining industry is one of the many workplaces where activities can expose workers to the above mentioned occupational hazards and it is, therefore, very important for workers to protect their eyes against these hazards. There are various PPE that can be used by the workers in the mining industry to protect their eyes against occupational injuries and infections. These PPE include, amongst others, safety spectacles which have tougher lenses for protection of the eyes, eye shields which can be worn over normal prescription glasses, safety goggles, which are made of plastic frames and an elastic headband and, lastly, face shields which protect the whole face including the eyes (Safe and Healthy Working 2007).

Adams et al (2007:203) includes welding goggles and shields as other type of PPE that can be used to prevent eye damage that might be caused by bright lights and heat from metal surfaces at melting point, as well as from arc welding.

**Problems encountered with eye protection devices**

According to Adams et al (2007:204), the use of eye protecting PPE may interfere with usage of respirators. Eye protecting PPE also accumulate condensation, which makes it difficult for workers to see well through the mist and its (eye protecting equipment) surface may easily scratch resulting in a field of vision being affected.

The US Department of Health and Human Services (2007) states that workers sustain eye injuries due to the fact that they don’t wear the right protection, or the eye protection does not fit the workers properly.
Guild et al (2001:436-437) state the following problems which workers encounter while using eye personal protective equipment.

- Eye protectors may not fit properly, as they are not customarily made for the person that uses them.
- Eye protector sometimes does not guard against the occupational injuries or illness that they are supposed to protect the worker from resulting in a worker getting injured despite putting on the personal protective equipment.
- Eye protectors used, e.g. goggles, may be incompatible with other personal protective equipment e.g. respiratory and/or ear protectors.
- Spectacles that the worker puts on for correction of vision might interfere with eye protectors that the worker wears to protect his eyes, and visa versa.
- Eye protecting goggles are uncomfortable to wear and this might lead to workers removing them from time to time. This can result in loss of protection against injuries to the eye.

### 2.3.4 Foot and leg PPE

Workers need their feet to walk around from one point to the next. Since the mining industry has activities that can pose as a danger to workers’ lower extremities, safety measures need to be taken to protect them from all types of trauma.

To safeguard the workers feet, there are different types of PPE that can be used. These PPE, according to Safe and Health Working (2007), include safety boots or shoes, for example, the wellington boots that have steel toe-caps built into them to protect the feet and toes from heavy objects or other falling objects that could crush the feet. Then there is also anti-static and conductive footwear that protects against the build up of static electricity.

Adams et al (2007:27), have also indicated gumboots and safety shoes with ankle support as other types of foot PPE, while Guild et al (2001:438), added clogs, leggings, foot and shin guards, thigh and foundry boots as other types of PPE that can be used for foot and leg protection. The US Department of Labor (2008) has listed metatarsal and toe guards, which protect the instep area and toes from impact and compression hazards.
Problems encountered with foot and leg PPE

Robinson (2001), states the following as problems which are caused by foot personal protection equipment:

- Severe aching feet
- Blisters
- Calluses
- Corns
- Rheumatism
- Malformation of toes
- Fallen arches (flat feet)
- Bunions
- Sprains

The above mentioned problems are caused by poorly fitting footwear that is too loose or too tight, heavy and lack arch support.

According to Guild et al (2001:360-361), ill-fitting boots can cause severe aching of feet, thus restricting movement. It can also cause calluses, corns and mechanical strain of the feet, while humid environment inside the foot PPE (boots) can predispose a worker to skin maceration, irritation and can result in fungal and bacterial infection and malodours of the feet.

The importance in the fit of foot protecting PPE is illustrated in the repeated comments by many authors. According to Abeysekera (2007), poor fitting PPE cause pressure on the skin resulting in pains and aches on the worker’s feet. They cause injury and swelling of the feet. Friction as a result of too loose safety shoes can cause cuts behind the heels. Other problems that are cited include:

- Weight: where boots that are heavy put pressure on feet and result in difficulty in moving around.
- Safety: where the shoes are non-grip and as such these become slippery in wet conditions.
• Design: where feet become cold due to the steel toecap in safety shoes/boots.

2.3.5 Hand and arm PPE

Most, if not all workers, use their hands to perform their duties in the mining sector. Unfortunately hands are the most vulnerable parts of the human body as they are prone to injuries and infections. Adams et al (2007:205) states that fingers and hands get easily bruised in the processes of work. Palms and fingers get bruises from working with spades or hoe in the garden, then just think of the damage that can be sustained in the mining industry with all the big machinery. For this reason it becomes vital for workers to protect their hands from occupational injuries and other forms of danger. A worker with injured hands can do less than a person with injured feet, as the latter can use his/her hands while seated.

According to Schoeman and Schroder (1994:390) hands should be protected against potential agents such as chemical substances including infecting agents, mechanical injuries, bruises, abrasions, temperatures including severe cold and severe heat, electric shock, falling objects, sharp objects, and many more occupational injuries and illnesses that workers are exposed to.

Types of hand and arm PPE

Hands should be protected by using the correct type of hand protection. According to the University of Western Australia, Safety and Health (2008), there should always be sufficient gloves so that it is easy to change or replace them should a need arise. Different sizes of gloves should always be available as workers do not all have the same size of hands. There should also be different types of gloves to cater for different hazards, as one type of glove cannot cater for all types of hazards, for example there are gloves that protect against infections, trauma and those that protect against chemicals.

Various materials can be used for different kinds of gloves. These might either be cloth, leather, latex or plastic coated gloves; wrist cuffs and armlets which are used, for example, when cutting glass and/or handling cut glass. Lastly, barrier creams can be used if it is not practical to use gloves to protect the hands against chemicals.
Problems encountered in the use of hand and arm PPE

According to Abeysekera (2007), ill fitting gloves may interfere with performance of certain tasks. For example, loosely fitting gloves can slip off easily, thus increasing the operational time thereof. The other problem is that the use of gloves may result in the limiting of hand and finger movement. Workers have also complained that gloves increase hand sweat making it difficult to retain them.

According to Canadian Centre for Occupational Health and Safety (2007), some materials used for gloves like latex, can cause allergies to the users; they can also leak, resulting in no protection from chemicals for the user. Cornell High Energy Synchrotron Source (2007) indicates that one of the problems with gloves is that they can be caught between parts, especially if they do not fit snugly, resulting in serious injuries to the worker. This is supported by Safe and Healthy Working (2007) in the explanation of potential danger of entanglement during drilling if one is wearing loose fitting gloves.

Gloves need to be removed for some particular tasks that need fine manipulation and dexterity regardless of the presence of hazards (Hickling 1986). Sometimes gloves need to be removed to undo straps or buckles. Some plastic gloves may be impossible to use in cold weather, as they become hard.

2.3.6 Body PPE

A normal person will normally not walk around naked. People need clothes to cover and protect themselves all the time. These clothes protect us against harsh conditions like heat, cold, excess moisture like rain and spills. There are also dangerous chemicals including bacteria which various types of protective clothing can protect us against. We, therefore, according Safe and Healthy Working (2007) need water and weather proofing and also insulating clothes.

The human body must also be protected against corrosive and dangerous chemicals and other substances that workers could encounter in the mining industry such as abrasions and bruises. These protective clothing should also protect against dirt and dust. According to Adams et al (2007:198), there are reflective clothes which help
workers to be visible in the dark. These clothes also ensure that workers are visible to oncoming traffic.

**Types of body PPE**

Body PPE might be overalls, aprons, life jackets and capes that protect against hazardous substances. Harnesses will assist in holding or suspending workers in heights and back supports are used for workers who stand or sit for prolonged periods like long distance drivers. Body PPE could also be clothing that is used to retain heat in cold weather and absorb sweat in warm and hot weather such as socks, vests, jackets and shoes that are used for visibility if this is for dark places or in water these could also be reflective (Guild et al 2001:438).

To ensure that dangerous substances like radiations and toxic substances are not taken home, protective clothing must be washed using commercial laundries and avoid taking protective clothing home for washing. Workers should also be trained on how to use and take care of protective clothing (Schoeman & Schroder 1994:393).

**Problems encountered with body PPE**

Protective clothing may limit the loss of body heat, which may result in discomfort and possible stress. According to Guild et al (2001:447), some garments may also restrict the movement of limbs, which can in turn slow the worker and increase fatigue.

According to Abeysekera (2007) problems encountered with body PPE include:

- Discomfort in terms of compatibility with the weather, weight and mobility.
- Acceptability in terms of fashion as the item might not be accepted for the way it fits, style and material.
- If the PPE is loosely fitting, it can be caught in moving machinery resulting in injuries to the worker.

According to the US Department of Labor (2007), if PPE does not fit properly, it may not provide the desired protection. It can also discourage employees from using it (PPE).
2.3.7 Respiratory PPE

Exchange of gases, that is, inhalation of oxygen and exhalation of carbon dioxide, is a continuous process that occurs for the existence of human beings every moment as long as we are alive. People are always breathing, whether walking, relaxing, working and asleep, even when under a general anaesthesia in the operating room.

According to Guild et al (2001:426), most workers accept the use of other types of PPE, for example, eye protecting PPE, hard hats, safety shoes because the consequences of not using these are immediately visible and sometime very dramatically so. Workers do not readily use respiratory PPE because they seem unimportant as harmful contaminants in the air are not easily seen, and the damaging effect is not always felt immediately – sometime only several years later. In the same breath suffocating incidences are life threatening, therefore use of PPE in such circumstances is not negotiable.

Respiratory PPE can be classified as air purifying devices as well as those that supply air. A respirator as defined by Schoeman and Schroder (1994:360) is a product that the wearer uses to enhance breathing in the presence of toxic substances in the atmosphere. The respirator must be able to cover the nose, mouth and chin and must be capable of removing toxic substances from the air that is breathed in by the wearer. Respirators should be able to filter or clean contaminated air, which is breathed in, and must sometimes even be capable of supplying clean air from an independent source.

Half-mask respirators is another type of respiratory protecting PPE that can be used to cover the mouth and nose in order to protect the worker against either dust, gas or vapour. (Guild et al 2001:428).

In order to ensure effective respiratory protection:

- Respiratory hazards and contaminants in the work area must be identified.
- Health effects of contaminants that are found in the work area must be understood.
- Appropriate respiratory PPE to be used are selected.
• Workers should be trained in the proper use and maintenance of respiratory PPE (Guild et al 2001:430, 431).

Problems encountered in the use of respiratory PPE

Guild et al (2001:430,431) lists the following problems with respiratory PPE:

• Facial hair, missing dentures and some skin conditions may affect the seal of the respirator, resulting in leakage of contaminated air into the mask.
• The respirator may not be able to protect the worker against all contaminants that are present in the work area at a particular time.
• Respirator use may place a physiological burden to an employee, due to his medical condition.
• Respiratory protection is generally uncomfortable to wear; especially those that use lungs to provide motive power.

A wrong choice of a respirator may seriously affect the health of the wearer. Abeysekera (2007), states that in cold environments the expired air within the respirator can condense in the respirator valve or icing of the valves can occur leading to discomfort. Safe and Healthy Working (2007), indicates that the tight fitting face-piece of the respiratory protection equipment may be too tight or too loose resulting in discomfort. This is also affected by the wearer’s facial characteristics, for example weight gain or weight loss or change in the condition of the teeth.

According to Schoeman and Schroder (1994:374-379), the use of respirators can reduce the field of vision; the additional weight they carry can add additional stress on the respiratory system resulting in claustrophobia. Leaks that are caused by a seal that does not seal properly against the face of the worker can hamper the effectiveness of the respirator. The unfortunate thing is the time it takes for respiratory problems to manifest, as the worker may have an impression that he or she is sufficiently protected when in fact he or she is not.
2.4 GENERAL PROBLEMS THAT WORKERS ENCOUNTER WITH THE USE OF PPE

Miller Electric Mfg Co (2008) indicates that some activities that workers do, like welding generate a lot of heat and it therefore becomes uncomfortable if a PPE such as gloves, helmet, woollen hats, boots or full-length pants have to be added for protection.

According to the New York Committee for Occupational Safety and Health (2007), the following are some of the general problems with PPE use, whereupon:

- Wearing PPE can be uncomfortable especially in hot weather.
- PPE can be awkward.
- Many workers tend to complain that PPE gets in their way thus limiting mobility and visibility.
- Some workers may not be able to wear PPE due to illnesses or certain conditions that they have, for example a worker with ear infection cannot use earplugs.
- PPE only protects the person wearing it, and does not protect those around him.
- Incorrect fit, use of wrong, poorly maintained or damaged PPE can result in less than adequate protection.

Safe and Healthy Working (2007), concurs with the New York Committee for Occupational Safety and Health (2007), in mentioning the limiting factor of PPE that of only protecting the person wearing it and not those around him or her.

2.5 CONCLUSION

Types of PPE that can be used in the workplace as well as the problems associated with the various PPE have been discussed in this chapter. The chapter also discussed legislation that deals with PPE.

Chapter 3 will discuss the research design and methodology.
CHAPTER 3

Research design and methodology

3.1 INTRODUCTION

Chapter 2 presented the literature review for this study, which highlights what is already known about problems encountered by workers in their daily use of PPE. In this chapter, the research methodology used for this study is discussed. Research methodology is methods and procedures used in implementing research designs (Babbie & Mouton 2003:64).

3.2 RESEARCH METHODOLOGY

3.2.1 Research setting

The setting in Foskor Mine Phalaborwa was outlined in chapter 1. This is a mine that extracts phosphate rock and ore, it also mines Zirconia. It is situated in Limpopo Province, South Africa. Like any other mine, its workers are exposed to occupational illnesses and injuries and these are related to their activities as they conduct their daily business. There are about one thousand two hundred and twenty three (1,223) employees of which one hundred and twenty three (123) are females. Out of these employees around nine hundred (900) of them use PPE while others do not.

All workers at Foskor Mine work on the surface as there is no underground mining. It is difficult to know the number of contactors as they do not have fixed terms at the mine. There are about three shifts of eight (8) hours as Foskor Mine operates twenty four hours everyday. Some of the employees at Foskor Mine are unable to read and/or write and for these adult-based education and training (ABET) programme is offered to help them with literacy.

On employment workers are orientated to the activities and processes of the mine and depending on placement, appropriate PPE is issued. Workers are orientated and
trained on the use and care of PPE, its importance and legal issues around non-compliance to ensure that these are used properly and workers are protected at all times.

3.2.2 Research design

Research design is a plan that the researcher follows in order to be able to answer research questions and respond to the problem statement (Barbie et al 2002:64; Blanche & Durrheim 1999:29). Research designs can either be experimental where there is a need to compare variables or test these or can be non-experimental when the enquiry relates to cause and effect. Another differentiating aspect between these designs is that experimental designs are interventive while non-experimental are not (Polit & Beck 2008:271).

For this study a non-experimental explorative, descriptive and quantitative research design was used to explore and describe the problems mine workers at Foskor Mine in Phalaborwa experience with PPE.

3.2.2.1 Exploratory research

In this study the design was exploratory because there was no information available about the problems in the use of PPE in Foskor Mine. According to Johnson and Christensen (2004:22) and Blanche and Durrheim (1999:39) an exploratory design attempts to generate ideas about the phenomena under study. It is used to make preliminary investigations into relatively unknown phenomena. Exploratory research aims at investigating the nature of the phenomenon, its existence and other factors and characteristics peculiar to the phenomenon in order to gain information not previously known about the phenomenon (Polit & Beck 2008:20). In this study an unexplored phenomenon of the problems in the use of PPE at Foskor Mine was explored to provide information on the nature and extent thereof.

3.2.2.2 Descriptive design

The primary purpose of a descriptive study is to provide a clear understanding or picture of attitudes, condition of a phenomenon, its nature and characteristics (Wimmer &
Dominick 2006:445). Descriptions may be given in terms of narratives, classifications and relationships (Blanche & Durrheim 1999:39). The purpose of using a descriptive design in this study was to allow the respondents to answer research questions and describe the problems mine workers encounter in their daily use of PPE. Open-ended questions found in the questionnaire provided this opportunity.

3.2.2.3 Quantitative design

Quantitative design focuses on measurable aspects. It uses numbers over words to measure impact (Babbie & Mouton 2003:64). Burns and Grove (2003:27) define quantitative research as a formal, objective, rigorous and systematic process for generating information about the world. According to Van der Walt and Van Rensburg (2006:11) data, when using quantitative design, must be objective and be presented numerically.

Quantitative design was vital for this study as most of the data gathered had to be quantified in order to explicitly present the problems encountered by mine workers in their daily use of PPE so that management could be able to prioritize these for better management. Quantitative design also made it easy to summarize, aggregate, and compare findings (Burns & Grove 2003:27; LoBiondo-Wood & Haber 2002:498).

3.3 RESEARCH METHOD

According to Polit and Hungler (1993:440) research method is composed of steps, procedures and strategies that are used by the researcher in a research investigation. The discussion of the research method includes the population, sample and sampling technique, data collection and data analysis.

3.4 POPULATION

In research the population is a group of people, items, objects or elements that bear the characteristics of the phenomenon to be studied and from which a sample is selected (Babbie & Mouton 2003:100). There are two types of populations, accessible and target population. Accessible population is the aggregate of cases that conform to the designated criteria. They form a part from which a sample is selected. Target population on the other hand is that group of people, items, objects or elements from whom
generalizations can be made. The target population of this study consisted of all Foskor Mine workers in Phalaborwa, including contractors working at Foskor Mine premises who use or were supposed to use PPE while on duty in order to protect themselves against occupational injuries and illnesses.

3.4.1 Sample and sampling technique

For the research to be rigorous, it is important that the researcher intimately engages with those responding to the questions asked. Sampling is the process of selecting a number of individuals, items, elements or objects from the larger population of the study in such a manner that these are representative of the study population from which they are selected (Gay 1992:123; Polit & Beck 2008:339). This reduces the number of people allowing for more intense engagement.

For scientific enquiry, depending on the type of the problem investigated, it may be important for every participant to be afforded an equal chance to take part in the study or certain individuals may be included in the study based on the information they are able to share. Therefore sampling approaches may either be probable or non-probable. A probable sampling approach allows for random sampling where each individual has an equal chance of being selected to participate in the study. Non-probable sampling technique would be where selection of the sample is based on the availability of the sample. A sample is a subset of the population. It is selected to represent the whole study population and must bear all the characteristics of the population (Polit & Beck 2008:339).

In this study a non-probability convenience sampling approach was used to select 65 respondents from the target population of Foskor Mine workers (both full time employees and contractors) in Phalaborwa.

Walizer and Weiner (1978:437) and Polit and Beck (2008:759) define convenient sampling, as a sampling method where respondents are selected conveniently as and when they become available. Convenience sampling in some instances can be equated to purposeful sampling where the selection of respondents is based on the participants’ knowledge about the phenomenon being researched or the researcher
hand-picks sample members based on her/his knowledge of their capability in relation to the phenomenon studied.

In this study convenience sampling was used to select miners as they attended the sick bay in the mine, usually for their yearly periodic medical examination. The researcher distributed the questionnaires to the first 65 respondents who attended the occupational health centre in the first week of April, 2008 and were willing to participate in the study. The researcher explained to all respondents the purpose of the study and how the questionnaire is to be completed; emphasizing that there should be no indication of identification of self on the questionnaire in name or in kind.

The advantages of convenience sampling are that:

- The researcher can use the most available people as respondents
- It is cheap
- It is quick

The disadvantages are that:

- The sample is rarely representative
- The sample size has to be fairly large

3.5 CRITERIA OF INCLUSION IN THE STUDY

For a respondent to be included in this study he/she had to:

- be employed by or be a contractor at Foskor Mine, in Phalaborwa, for at least two years
- Use PPE daily when executing his/her work
- Be exposed to occupational illnesses and/or injuries.
- Be able to read and write
- Be willing to participate in the study
The implication of using the above criteria for inclusion was that the respondents would be knowledgeable of the phenomenon being researched and would therefore be able to provide the needed information.

Because self administered questionnaires were used as instruments for data collection, the exclusion criterion was inability to read and write.

### 3.6 DATA COLLECTION

Data is information that the researcher has to access for the study to be a success. The researcher can therefore use existing information mainly from literature, records and artefacts or generate data specific for the study. In most instances both forms are used whereupon researchers take advantage of existing data to form a basis for the new data to be collected, hence literature review.

Data collection is a systematic process in which a researcher collects relevant data from respondents by asking questions or opening a conversation about a phenomenon as well as reading about a phenomenon under study (Polit & Beck 2008:369-371). Questionnaires, interview schedules and guides, observations and observation charts, records and artefacts may be used as instruments to collect this data and the activity can be:

(a) face-to-face personal interview where the researcher sits and talks and asks questions from the respondent. Responses are recorded. In some instances where face to face encounters are not possible, telephone calls may substitute this activity.

(b) self-completion of the questionnaire where respondents respond to questions asked on a questionnaire by completing these. This can be done independently or with the help of the researcher. Usually respondents are required to have a competence in reading and writing.

(c) perusal of records in the form of minutes, monograms, theses and dissertations or any written materials, information of which contributes to the findings of the study and can be included in the analysis of data.

(d) observation whereby the behaviour and or characteristics of the sample is/are observed and reported on.
The data collecting instrument used in this study was a questionnaire, which consisted of close-ended and open-ended questions and respondents were to complete these independently without the assistance of the researcher.

Open-ended questions, according to Woods and Catanzaro (1988:562), are questions that have no fixed answers from which the respondents have to choose. Respondents are, in open-ended questions, asked to either qualify their responses or provide their own perspective to the issue at hand.

Close-ended questions are defined by Polit and Hungler (1993:432) as questions where respondents have to categorically choose from given responses on answers they consider appropriate for the question asked. Respondents are usually provided with a list or a yes/no category to choose from. Examples of close-ended questions which respondents can choose from are those relating to:

- Gender = Male or female
- Residence = Urban or rural area
- Race = African or Indian

According to Polit and Hungler (1993:159), the advantages of questionnaires are that:

- They are less costly, than other data gathering methods.
- They require less time for data gathering.
- They require less energy as respondents are given a questionnaire to complete, while in other data collection methods the researcher himself/herself has to sit and interview respondents and complete the interview guide.
- They are able to offer anonymity. This is possible as the respondent complete the questionnaire by himself. If the respondent does not include his/her name on the questionnaire, the researcher or whoever comes into contact with the questionnaire might not know who the respondent is.
- The absence of the researcher ensures that there is no bias in responses. This is true, as the respondent will be able to respond freely without being intimidated by the presence of the researcher. If the researcher is present, the respondent might give a response that he thinks the researcher will be happy with, which may not necessarily be the situation.
The disadvantages of questionnaires include:

- Unreliable response, where the respondent may elicit the assistance of those around him or her.
- The return rate is usually poor as this is entirely dependent on the commitment of the respondent.
- Where mailing has to be done this may be quite expensive.

The questionnaire for this study is included as annexure 1.

3.7 DATA COLLECTION PROCESS

In this study the questionnaire was given out to the first 65 sample respondents who fitted the inclusion criteria, when they came to the occupational health centre seeking medical attendance. The purpose of the study was explained to each and every one of the respondents. The completion of the questionnaire was also explained and respondents were not to add their names or anything that would identify them as individuals as anonymity and confidentiality had to be maintained. The actual response and completion of the questionnaire was to be done independently by the respondents to avoid bias from the researcher and other workers.

Respondents were then requested to complete the questionnaire at their convenient time and place. It was also emphasised that they took part in the study at their own will, without pressure from anyone. They were also at liberty to withdraw from the study without any repercussions. All respondents were asked to sign consent before they took part in the study. The consent was an indication that the purpose, aims and objectives of the study were explained to them and that they understood the implications of participation thereof. It was emphasised that the consent is by no means binding as they are free to withdraw from the study even after the signing of the consent.

After completing the questionnaire respondents were advised to seal the questionnaires in the provided envelope and drop this in the occupational Health Centre post box. It was again emphasized that respondents were not to write their particulars on the envelope to ensure anonymity.
3.8 PRE-TESTING OF THE INSTRUMENT

Pre-testing of the instrument was done by selecting five (5) workers who were not part of the sample to respond to the questionnaire. The five workers included a safety officer, a foreman and three ordinary workers who used PPE in the execution of their daily activities in the mine. According to Cohen, Manion and Morrison (2002:260) and LoBiondo-Wood and Harber (2002:255), pre-testing of an instrument is done to:

- Determine if the language used is clear and is understood by the respondents.
- Determine whether the questionnaire is not too long or too short.
- Determine the time taken to complete the questionnaire.
- Determine whether the questionnaire is not difficult.
- Determine commonly misunderstood questions.
- Get feedback on validity of questions.
- Check validity and reliability of the research instrument.

Following the pre-testing of the instrument the questionnaire was found to be too long and items were reduced from sixty-one to forty-eight. An example of a question, which was taken out of the questionnaire, is ‘what kind of occupational illnesses did your co-workers acquire while on duty’. This question was found to be unnecessary as it was difficult for respondents to know about this aspect as workers often do not discuss their diagnoses amongst each other.

Some questions were also not clear and had to be rephrased. An example of such a question is: ‘Were you instructed on how to use PPE issued to you’? This was changed to be ‘were you taught on how to use PPE given to you’?

3.9 DATA ANALYSIS

Data analysis is the methods of analyzing data in a way that research question can be answered (Polit & Hungler 1993:431). This data analysis was done using quantitative analysis. Data that was collected was put on either graphs or pie chart and in some instances on tables. Responses on close-ended questions were calculated and converted into percentages in order to analyze the data quantitatively.
3.10 VALIDITY AND RELIABILITY

3.10.1 Reliability of instrument

Reliability of an instrument relates to the accuracy and consistency with which an instrument is able to measure a variable resulting in the same result being recorded at different times (Wiersma 1991:274).

In this study the results of the pre testing of the instrument were compared with those of the real study to test reliability of the study instrument.

3.10.2 Data collection reliability

To ensure data collection reliability respondents were advised to respond to the questionnaire in a convenient place like at their homes, a private room or at the library. The reason respondents were advised to use a convenient place was that they needed a place where they would not be disturbed, in order to concentrate while responding. In the work place there were many disturbances such as co-workers or supervisors walking in and out and industrial noise from machines.

The respondents could come back for clarification on aspects that they did not understand so that these could be explained and similar understanding is reached by all respondents. This offer was made even though the explanation was done at the time of distribution of questionnaires. In this study no one came back for additional clarification of aspects after the initial explanation during the distribution of questionnaires.

3.10.3 Validity

Validity is described as a measure of accuracy, relevance and precision (Sarantakos 2005:83). In essence an instrument is valid if it measures what it intends to measure at all the times it is administered. In this study the relevance was to measure the problems that workers encounter in their daily use of PPE.

3.10.4 Content validity
Content validity is defined by Burns and Grove (2003:793) as ensuring that all major elements relevant to the construct which is being measured are included in the method of measurement.

In order to ensure content validity the researcher had to gather knowledge about the study phenomenon. This can be achieved by literature review of the topic being researched and reflected in the structure of the instrument.

3.10.5 Construct validity of the instrument

Construct validity is an evaluation of the degree to which an instrument measures the construct the researcher wishes to measure (Kidder 1986:133). One method of ensuring construct validity is to test the current tool against another tool. For this, the other tool that was used was the pre-tested instrument. The use of constructed groups ensured construct validity in this study.

3.10.6 Face validity

Face validity is defined as measurements, which appear to be measuring an item under study (Woods & Catanzaro 1998:557). Face validity was validated by the supervisor who on reviewing the instrument was satisfied with its construction. The supervisor was an expert in research and in occupational health issues.

3.11 ETHICAL CONSIDERATIONS

3.11.1 Permission to conduct the study

The proposal to conduct this study was presented and approved by the Department of Health Studies at the University of South Africa. Permission was also sought and received to conduct the study from management of Foskor Mine, Phalaborwa (see annexure 3 for the letter of request to conduct the study). A copy of the letter from Foskor Mine granting permission to conduct the research is included as annexure 4.

3.11.2 Informed consent
All respondents were given consent forms to complete. The purpose of the consent form was fully explained to them. It was emphasized that giving consent meant that they agree to take part in the study knowingly, and freely. It was further explained to them that they still had the right to withdraw from the study even after giving consent, (a copy of the informed consent form is included as annexure 2).

The consent form according to Brink (2002:4) should have the following major elements:

- Information including research process about the research to be conducted
- The purpose of the research study.
- The objectives of the research study
- The benefits and no benefits of the study
- The disposal period of the raw data, bearing in mind that this may be required to prepare articles for publication in scientific accredited journals.

All the above elements were included in the informed consent form that was given to the respondents in this study.

3.11.3 Right to confidentiality

Respondents were assured that data collected from them would not be made accessible to any person. This was done to protect respondents’ confidentiality. The raw data collected from respondents according to Burns and Grove (2003:172) can only be disclosed with the authorization of the subjects. All raw data that was collected was never shown to anyone except the supervisor. It was kept under lock and key to ensure confidentiality and to safeguard it. The disposal time of one year was negotiated with respondents because the raw data may be required in the preparation of Journal articles.
3.11.4 Anonymity

Anonymity is when the respondent cannot be identified in line with a given respondent (Babbie & Mouton 2003:523). Anonymity in this study was maintained by not using names on the questionnaire. This ensured that respondents remained anonymous, as they could not be linked with responses that they gave.

The implication of this on the study was that the researcher was never able to do follow up with respondents who had more information, which needed follow up. This was seen as a limiting factor that will be discussed in chapter 5 of this study.

3.11.5 Principle of justice

In this study respondents were not exposed to any discomfort or harm, which could either, be physically, spiritually, socially and/or emotional.

3.11.6 Persuasion

Respondents were not persuaded or coerced to take part in the research by any financial pressure or threat of punishment. Participation was voluntary.

3.12 CONCLUSION

The research design and methodology was clearly defined in this chapter. The population, sampling technique and sample of the research was also discussed as well as data collection and ethical consideration. The following chapter will present data analysis.
CHAPTER 4

Data analysis

4.1 INTRODUCTION

In this chapter data that was gathered was analysed. From the 65 respondents who were given the questionnaire, 2 respondents did not return their questionnaires as they withdrew from the study. This resulted with only 6 questionnaires being returned to the researcher. From the 63 questionnaires that the researcher received, it was found that 13 questionnaires were spoiled as they were not correctly completed. This resulted in only 50 questionnaires being considered for the study. Data analysis will thus be done on the 50 questionnaires that were considered for the study.

4.2 STUDY FINDINGS

4.2.1 Duration of work at Foskor Mine.

According to the findings of the study, 16 (32%) out of 50 respondents had been working at Foskor Mine for 20 years or more. Figure 4.1 depicts the duration of employment of the respondents in years.

The implication of the above information is that most respondents have been working at Foskor Mine for a long time. Accordingly 40 (80%) of respondents had been working at Foskor Mine for more than five years.
4.2.2 Exposure to occupational illnesses

According to figure 4.2, 11 (22%) respondents reported that they were not exposed to occupational illness at the workplace. The other 39 respondents (78%) reported that they were exposed to a variety of occupational illness as outlined in table 4.1. These included respiratory illnesses such as asthma, tuberculosis, pneumoconiosis; noise induced hearing loss, dermatological conditions, heatstroke, radiation and HIV. Some respondents reported that they were exposed to more than one type of occupational illnesses.
Table 4.1: Possible occupational illnesses respondents reported to be exposed to

<table>
<thead>
<tr>
<th>OCCUPATIONAL ILLNESS</th>
<th>POSSIBLE CONTRIBUTORY CAUSE</th>
<th>NUMBER OF RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory/chest ailments. This includes Tuberculosis and Pneumoconiosis.</td>
<td>Exposure to dust, chemicals, and smoke.</td>
<td>36 respondents (72%)</td>
</tr>
<tr>
<td>Noise induced hearing loss</td>
<td>Exposure to constant and continuous noise of 85 decibels and above.</td>
<td>24 respondents (48%)</td>
</tr>
<tr>
<td>Dermatological conditions</td>
<td>Fungal infection due to boots that are continuously moist. Chemical allergic reactions.</td>
<td>2 respondents (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 respondents (20%)</td>
</tr>
<tr>
<td>Heat stroke</td>
<td>Exposure to high temperatures for a long time.</td>
<td>7 respondents (14%)</td>
</tr>
<tr>
<td>Cancers</td>
<td>Exposure to radiation</td>
<td>4 respondents (14%)</td>
</tr>
<tr>
<td>Human Immune Virus</td>
<td>Being exposed to infected blood during first aid.</td>
<td>1 respondent (2%)</td>
</tr>
</tbody>
</table>

4.2.3 Diagnosis of occupational illnesses

Of the 39 workers who reported being exposed to illnesses, 7 respondents (14%) reported being diagnosed with some form of work related illnesses, 3 of them were diagnosed with hearing loss, 2 with chest ailments and 1 each with allergy and exhaustion respectively (see figure 4.3). All 7 respondents (100%) who were diagnosed with occupational illnesses had reportedly been using PPE at the time of diagnoses.

![Figure 4.3: Types of illnesses workers were diagnosed with](image-url)
4.2.4 Exposure to occupational injuries

In relation to occupational injuries, the same respondents who were exposed to occupational illnesses were also exposed to occupational injuries. Once more a variety of physical injuries were reported such as cuts, falling, and electric shock as well as well as the description of parts affected such as the whole body, head, and limbs (see table 4.2). Some respondents were exposed to more than one possible occupational injuries.

Table 4.2: Possible injuries at Foskor Mine

<table>
<thead>
<tr>
<th>TYPE OF INJURY</th>
<th>POSSIBLE CONTRIBUTING FACTOR</th>
<th>NUMBER OF RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall and fractures</td>
<td>Falls from heights</td>
<td>9 respondents (18%)</td>
</tr>
<tr>
<td></td>
<td>Falling objects</td>
<td>8 respondents (16%)</td>
</tr>
<tr>
<td></td>
<td>Slippery floors</td>
<td>6 respondents (12%)</td>
</tr>
<tr>
<td>Multi trauma</td>
<td>Motor vehicle accidents</td>
<td>6 respondents (12%)</td>
</tr>
<tr>
<td>Burns</td>
<td>Hot water, fire and chemicals</td>
<td>5 respondents (10%)</td>
</tr>
<tr>
<td>Electric shock</td>
<td>Malfunctioning electrical equipments</td>
<td>5 respondents (10%)</td>
</tr>
<tr>
<td>Cuts on body parts</td>
<td>Faulty machinery</td>
<td>3 respondents (6%)</td>
</tr>
</tbody>
</table>

4.2.5 Injuries on duty

A total of 19 respondents (38%) had been injured on duty. the injuries sustained were serious as they impacted on the individual’s ability to function. There were 14 workers who sustained injuries on the limbs (11 hand and 4 lower limbs including toes) (see figure 4.4). From the findings 17 respondents (89%) who were injured on duty were using appropriate PPE. Only 2 respondents (11%) were not using PPE when they got injured. The reasons given by the two respond for not using PPE at the time of their injuries were given as:

- Discomfort as PPE was too hot
- Unavailability of PPE at the time of injury
4.2.6 Employers contribution in the supply of PPE

The question that was asked was whether employers provided PPE to employees. The response was 100% positive in that all respondents indicated that the employers provided PPE. Only 1 respondent had to pay for the PPE, the rest were provided with PPE free of charge.

The types of PPE supplied were in line with the work that employees performed, so that 1 employee could have as many as 5 PPE depending on tasks performed. These PPE included ear plugs, ear muffs, facial masks, safety goggles, overalls, aprons, coats, vests, raincoats, hand gloves, safety boots, leggings, head gears and many more. On many instances (66%), respondents were not involved in the choice of PPE. The employer arranged for PPE in line with the Mine Health and Safety Act (Act No of 1996).

4.2.7 Exchange or replacement of PPE

According to the responses, almost all PPE were exchanged yearly or when necessary. Only 1 respondent (2%) mentioned a quarterly exchange of PPE (see figure 4.5).
4.2.8 Use of PPE

A total of 42 (84%) reported regular use of PPE while the 8 (16%) who did not use their PPE regularly gave a variety of reasons including discomfort and difficulty to apply. The reasons are outlined in figure 4.6.

Figure 4.6: Reasons for not using PPE

4.2.9 Teaching received about the use of PPE
Only 9 (18%) of the respondents reported that they were not taught on how to use PPE. The rest were taught by a variety of people including Safety representatives, supervisors, trainers and co-workers as outlined in figure 4.7.

![Figure 4.7: Those active in the teaching about the use of PPE](image)

4.2.10 Sharing of PPE

Only 5 (10%) respondents reported having to share PPE, which were listed as welding helmets, face masks and heat restricting masks (see figure 4.8). This is a crucial revelation and even though reported by a small number, it is important to note this as it may indicate a shortage of these PPE as well as the unhygienic aspect of the sharing thereof.
4.2.11 Maintenance of PPE

A total of 48 (96%) respondents knew how to take care of their PPE and 45 (90%) reported their PPE to be in good order at the time of the study.

4.2.12 Problems experienced with the use of PPE

A total of 36 (72%) respondents experienced problems with the use of PPE. The problems were categorized according to body parts that were affected. For example, eye protecting PPE, general PPE, hand protecting PPE, or foot protecting PPE. A respondent could give more than one problem. The following were reported as problems with PPE:

4.2.13 General problems with PPE

There were 14 (28%) respondents who provided information on these problems: These were listed as:

- Greasy and oily PPE
- Poor fit, either too big or too small
- Heavy, uncomfortable, and hot PPE which were a hindrance or actually posed a danger when working
- Poor quality PPE
- Easily damaged PPE

**Hand protecting PPE problems**

These were listed by 4 (8%) respondents as:

- Oily gloves
- Allergic reaction to gloves
- Inability to loosen bolts and nuts when wearing gloves
- Gloves uncomfortable to work with

**Respiratory protecting PPE problems**

These were listed by 4 (8%) respondents as:

- Dust mask uncomfortable and distressing
- Uncomfortable and difficult breathing due to mask
- Mask becoming moist when used for a long time
- Dust enters the nose despite the use of the mask

**Eye protecting PPE problems**

These were listed by 3 (6%) respondents as:

- Poor vision due to goggles misting up.
- Goggle incompatibility with other PPE such as masks and helmets
Ear protecting PPE problems

These were listed by 4 (8%) respondents as:

- Irritation resulting in itching ears due to ear plugs
- Communication problems due to earplugs
- PPE cause infection (discharging) and painful ears
- Ear muffs too big and incompatible with other PPE such as helmets and masks that hang from the ears

Head protecting PPE problems

There was only 1 (2%) respondent who gave weight as the problem related to helmets. He stated that helmets tended to be heavy and therefore quite tiring on the neck.

Foot protecting PPE problems

These were listed by 13 (26%) respondents as follows:

- Poor fitting safety boots causing corns and blisters on feet or if these were tight they also pressed on the feet causing swelling of feet.
- Safety shoes too hot.
- Uncomfortable or poor quality boots which caused sweating predisposing workers to fungal infection.
- Painful legs due to safety boots.
- Slippery boots when walking.
- Heavy tiring boots.

4.2.14 Action taken about PPE problems

Respondents gave an account on the action taken by both employees and employers.
Action by employees

The response was provided by 36 (72%) respondents who reported that they did experience problems with PPE. The respondents reported on a variety of responses on actions taken for these problems, where 14 (28%) reported the problem encountered to their supervisor or foreman, 4 (8%) reported their problems to the safety officer, while 2 (4%) reported their problems to both supervisor/foreman and safety officer. Others, 4 respondents (8%), said they did nothing about the problems experienced (see figure 4.9).

![WHAT WORKERS DID WHEN THEY BECAME AWARE OF THEIR PROBLEMS](image)

**Figure 4.9: Action taken by workers when they became aware of their problems**

Action taken by employer

The response from the employer as presented by the respondents was not good. Whereas most did not respond, nearly half, 24 (48%), of the respondents responded that their problems were never solved by their employer.

### 4.2.15 Respondents’ contribution to the solution of problems experienced with the use of PPE

The following are solutions which 26 of the 36 respondents who experienced problems with the use of PPE reported to have proposed to management. Respondents gave
different solutions which were difficult to quantify or categorise. Solutions that were given were as follows:

- Soft boots, shoes, and socks to be supplied.
- Change boots to Bova shoes (type of safety shoes).
- Issue proper PPE.
- Get good supplier of quality PPE and change present poor quality PPE.
- Make working environment cool so that PPE must not be hot.
- Issue correct size of boots, use barrier creams and fungicides.
- Issue only comfortable PPE.
- Put extra pads on overall’s elbows, knees, and have raincoats of different sizes to improve the fit.
- Get good dust masks.
- There should be a variety of PPE to choose from.
- Workers should be supplied with quality material (PPE).
- Involve employees in choosing PPE.
- Rotate employees.
- Safety officers should spend some time with workers using PPE so that they could identify problems that the workers encounter while using PPE.
- Cheap PPE should be avoided.
- Employees should be given special safety shoes.
- Alternative PPE should be given to workers, as the present one being used is not comfortable.
- Quality PPE should be issued to workers.
- Different types of PPE should be supplied to workers.
- Workers should be given light PPE.
- Workers should be issued with comfortable and wide boots.
- There should be a variety of PPE to choose from.
- There should be a use of softer gloves.
4.2.16 Continued use of PPE

All (100%) respondents would continue to use PPE irrespective of problems experienced because they all knew and understood the reasons for the use of PPE as outlined in figure 4.10. If they had it their own way, 6 (12%) would not use PPE issued to them because of the reasons already advanced.

![Figure 4.10: Purpose for using PPE](image)

4.2.17 Reinforcement of use of PPE

From the orientation programme that employees received on employment, a total of 42 (84%) respondents were aware of the measures that are taken to reinforce the use of PPE, while 8 (16%) were not. Some of the measures are outlined in figure 4.11. These are quite stringent, including dismissal.
Figure 4.11: Measures to reinforce use of PPE

4.2.18 Compliance with the use of PPE

Although all workers in this study reported to know the reasons for using PPE, 9 (18%) respondents admitted to have been found without wearing/using PPE on at least one occasion. The reasons were outlined as indicated in figure 4.12.

Figure 4.12: Reasons why workers were found without wearing/using PPE
4.2.19 Availability of PPE programmes at the workplace

Almost half, 23 (46%), of the respondents did not know of any PPE programme at the workplace. This could be an indication of poor monitoring of processes in the use of PPE in the mine.

4.3 CONCLUSION

This chapter presented the research findings about problems that workers encounter with the use of PPE. It was evident from the gathered data that there are indeed problems that workers encounter with the use of PPE.

The following chapter will discuss conclusion, limitations and recommendations of the study.
CHAPTER 5

Conclusions, recommendations and limitations of the study

5.1 INTRODUCTION

This chapter forms the conclusion of the study where everything is summarised, recommendations made and limitations of the study outlined.

In chapter 1 an introduction to the study outlined the nature of Foskor Mine, especially in Phalaborwa. It also presented the problems in the use of PPE in the workplace and how these problems impacts on the workers in Foskor Mine. This was followed by a brief discussion of the research methodology which is discussed in detail in chapter 3 to form a framework for the study. Chapter 2 presented the supporting literature on PPE and problems that workers encounter when using these at the workplace. Data analysis was done in chapter 4.

Accordingly the abovementioned process met the stated objectives of the study which were indicated as:

- To establish problems encountered by workers at Foskor Mine, Phalaborwa, in the use of personal protective equipment.
- To determine whether workers know the importance for using PPE.
- To make recommendations on how to prevent or deal with problems encountered by Foskor mine workers in Phalaborwa in relation to the use of PPE.

5.2 SUMMARY OF FINDINGS

A total of 80% of the workers at Foskor mine have been employed for over 5 years. This is a considerable period in one employment and the exposure to mine injuries and illness was considered to be substantial as supported by the finding of a total of 78% (39) of those reportedly exposed to occupational injuries and illnesses. A total of 98% of
the respondents confirmed that the PPE was supplied by employers free of charge as was a legal requirement.

According to the findings, 38% (19) of the respondents reported being injured on duty with hand injury being the highest. From the 19 workers injured on duty, 17 of them were using PPE at the time of injury. The report about PPE being uncomfortable, especially the boots and gloves, supports the finding on the type of injuries suffered (see figure 4.4).

From the total of 50 respondents, 7 (14%) of them reported that they were once diagnosed with occupational illness, and all of them reported that they were using their PPE at the time that they were diagnosed with occupational illness. The highest figure in this category was hearing loss (see figure 4.3). This is in line with the listed problems relating to ear protecting PPE such as ear plugs and ear muffs.

The orientation to the PPE use was mainly done by safety officers (28%) and supervisors (26%) and 42 (84%) were aware of the consequences of not using PPE at the work place. Even though 82% of the respondents knew the importance of the use of PPE, 23 (46%) of the respondents stated that there were no programmes put in place to monitor the use of PPE during the working life of miners.

The problems that the mine workers encountered were mainly:

(a) Discomfort due to poor fit and poor quality, whereupon:

- **Shoes/boots.** Were either tight or loose resulting in corns, calluses, blisters or swelling of feet. The material for the shoes was in some instances of poor quality resulting in shoes that trap moisture hence a potential for fungal infection or the shoes would be so hard and heavy that it became difficult to move around or soft that these did not provide any protection from heavy falling objects resulting in feet being crushed.

- **Gloves.** These were also of poor fit, where the gloves were reportedly too small or too big. Small gloves often tore while it became difficult to work with big gloves. Loose parts often got entangled in machinery, hence the high number of hand injuries as indicated in figure 4.4.
• Overalls and raincoats. The poor fit was again the issue. Employers provided the 'one size fits all' type of these. The end result was non-compliance, because the loose fitting garments posed a danger to the workers and hampered performance.
• Face masks became wet and uncomfortable.
• Goggles tended to become misty and impaired vision.

(b) Sharing of PPE: although this problem was alluded to by 5 mine workers in relation to three PPE (welding helmets, face and heat restricting masks) the issue is critical as the practice is unhygienic, will enhance cross infection and may indicate a shortage of these PPE.

(c) Incompatibility of PPE especially where more than one PPE were to be used simultaneously.

Regardless of the stipulated problems, 88% of the mine workers stated that they would continue to use the PPE whether these were comfortable or not, because they know the value of PPE at the workplace

5.3 RECOMMENDATIONS

According to this study, respondents provided some meaningful recommendations such as:

• The involvement of mine workers in the choice of PPE. According to the study, 33 (66%) respondents reported that they are not involved in the choice of the PPE that they used at their workplace; as a result the size in some instances posed a challenge. Mine workers felt that involvement will maximize correct use of PPE whereupon mine workers will easily identify with these and be more willing to use them (Schoeman & Schroder 1994:360).
• There is emphasis on the provision of comfortable, good quality and well fitting boots/shoes, gloves, overalls and raincoats. To improve the fit and comfort, overalls should be padded on the shoulders, elbows, knees.
• PPE programmes must be instituted to monitor the use and impact of PPE in the mine as sustained use is paramount.
• PPE are important for both the employer and employee. For this reason continued campaigns on awareness about the importance of correct use of PPE should be held quarterly.
• Mine workers are not to share PPE with their colleagues. This is unhygienic and can spread infection among mine workers.
• Employers need to put supervisory mechanism in place to ensure availability, whenever necessary, to respond to problems when these are presented to them. In the study nearly half (46%) of the respondents reported that employers did not solve any of the problems presented to them.
• Written guidelines should be provided for workers to follow when they have problems with their PPE. These guidelines should provide lines of communications in cases of problems. They should be presented in a manner that is available to those who can read or not. Pictures and sketches should be used where necessary.
• Repercussions on non-compliance should be well-indicated.

5.4 LIMITATIONS OF THE STUDY

• This study cannot be generalised to all mineworkers as it was conducted in one mine only and the sample was small. The results will only be relevant to Foskor mine.
• The study excluded the illiterate mine workers yet these are more at risk than those who can read and write.
• The anonymity ethical requirement made it impossible for the researcher to follow up on those respondents who had more information on the problems encountered.

5.5 CONCLUSION

It is evident from the study that although PPE help in preventing occupational injuries and illnesses on workers, some have a negative effect if the fit and quality are not correct. Loose fitting PPE can be entangled in the machinery thus posing a danger to the worker. Similarly tight fitting PPE may tear and thus be of no use to the worker. Poor
quality may also contribute negatively to the protection of the worker. Hard boots have been reported to have caused calluses, corns, blisters and tight shoes have caused swollen feet. Poor quality shoes easily soak in water resulting in individuals developing cold feet and being predisposed to fungal infection. Some PPE have been observed to be ineffective hence workers still get injured while using these.

It thus becomes clear that proper engineering is the most vital way of preventing occupational injuries and illnesses.

Presently PPE is still the action of choice where the toxic substance in industrial chemicals cannot be removed or re-engineering of machines to reduce danger cannot be effected.
Bibliography


QUESTIONNAIRE

Mark the most appropriate response with an X on close ended questions. On open ended questions, fill in your own response to the questions.

1. How long have you been working at Foskor Mine?
   
   1.1 0 – 5 years =
   1.2 5 -10 years =
   1.3 10 – 15 years =
   1.4 20 years & more =

2. Are you exposed to occupational illnesses at your work place?
   
   2.1 Yes =
   2.2 No =

3. If “yes” what possible occupational illness are you exposed to?
   
   ______________________________________
   ______________________________________
   ______________________________________

4. Are you exposed to occupational injuries at your workplace?
   
   4.1 Yes =
   4.2 No =

5. If “yes” what possible occupational injuries are you exposed to?
   
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
6. Were you ever injured on duty?
   6.1 Yes =
   6.2 No =

7. If “Yes” what type of injury did you sustain?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

8. Were you making use of P.P.E issued to you at time of injury?
   8.1 Yes =
   8.2 No =

9. If “No” why did you not make use of the P.P.E supplied to you?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

10. Were you ever diagnosed with occupational illness
    10.1 Yes =
     10.2 No =

11. If “Yes” what occupational illness were you diagnosed with?
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
    ____________________________________________________________
12. Were you using P.P.E while on duty to prevent occupational illnesses?
   12.1 Yes =
   12.2 No =

13. Are you supplied with P.P.E by your employer?
   13.1 Yes =
   13.2 No =

14. Do you pay for P.P.E's issued to you?
   14.1 Yes =
   14.2 No =

15. If supplied with P.P.E which type(s) are you supplied with?
    ____________________________________________
    ____________________________________________
    ____________________________________________

16. Are you involved in choosing P.P.E that are supplied to you?
   16.1 Yes =
   16.2 No =

17. How often is P.P.E supplied to you exchanged for new ones?
    ____________________________________________
    ____________________________________________
    ____________________________________________

18. Were you taught how to use P.P.E issued to you?
   18.1 Yes =
   18.2 No =
19. If “Yes” who taught you how to use P.P.E, e.g. Supervisor, Safety Rep?

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

20. Do you know how to take care of P.P.E that you use?
   20.1 Yes =
   20.2 No =

21. In what condition of repair is P.P.E at present?

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

22. Do you use the P.P.E issued to you regularly?
   22.1 Yes =
   22.2 No =

23. If “No” why not?

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

24. Do you share P.P.E with your colleagues?
   24.1 Yes =
   24.2 No =
25. If “Yes” which P.P.E do you share?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

26. Have you ever experienced problem(s) while using P.P.E?
   26.1 Yes =
   26.2 No =

27. If “Yes’ which problem(s) have you encountered?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

28. Why did you experience the problem(s)?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

29. What did you do when you became aware of the problem(s)?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

30. Was the problem solved?
   30.1 Yes =
   30.2 No =
31. If “Yes” how was the problem solved?

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

32. Are you having any solution/recommendation to problem(s) caused by PPE?

34.1 Yes =

34.2 No =

33. If “Yes” what are your recommendations/solutions?

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

34. Would you continue to use PPE issued to you?

36.1 Yes =

36.2 No =

35. If “No” why not?

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

36. If you had it your way, will you use PPE?

38.1 Yes =

38.2 No =
37. If “No” why not?


38. Do you strictly always put on your PPE?

40.1 Yes = 
40.2 No = 

39. If “No” why not?


40. Do you see any purpose of using PPE?

42.1 Yes = 
42.2 No = 

41. If “Yes” what are the purposes?


42. Are there any repacations if you are found not wearing PPE?
   44.1 Yes =
   44.2 No =

43. If “Yes” what are the repacations?
   
   
   

44. Were you ever found without wearing/using PPE?
   46.1 Yes =
   46.2 No =

45. If “Yes” why did you not have your PPE on?
   
   
   

46. Do you have Colleagues who are reluctant to use PPE?
   48.1 Yes =
   48.2 No =

47. If “Yes” what are their reasons for being reluctant?
   
   
   
   
   

48. Is there any PPE program at your workplace?

50.1 Yes = 
50.2 No =
CONSENT FORM

I am a registered student with the University of South Africa (UNISA). I have registered for MA Cur degree and therefore have to do a research on problems encountered by Foskor Mine workers at Phalaborwa with the use of personal protective equipment.

The purpose of this research is to find out problems encountered by Foskor Mine workers with the use of personal protective equipment, and again to find out how these problems can be prevented or solved.

CONSENT

I __________________________ hereby consent to participate in the study as outlined above. Signed at ______________________ on the (DATE)__________________
Dear Sir

APPLICATION TO CONDUCT A RESEARCH STUDY AT YOUR INSTITUTION

I hereby apply to conduct a research study at your institution as part of my studies towards a Master’s of Heath Degree.

The topic of my research is PROBLEMS ENCOUNTERED BY FOSKOR MINE WORKERS WITH THE USE OF PERSONAL PROTECTIVE EQUIPMENT. The reason for my research is to find out problems that workers encounter while using personal protective equipments, so that steps can be taken to help prevent or solve this problems.

I will be grateful if my request can be granted.

Yours truly

ML PILUSA
10 October 2006

To:
Mr. ML Pilusa
BOX 7317
NAMAKGALE
1391

RE: PERMISSION TO CONDUCT RESEARCH IN THE FOSKOR WORKPLACE.

RESEARCH TOPIC: PROBLEMS ENCOUNTERED BY FOSKOR MINE WORKERS ON THE USE OF PERSONAL PROTECTIVE EQUIPMENT.

With reference to the above-mentioned matter I wish to inform you that your request has been approved. You are therefore formally given permission to conduct a research in the Foskor works area on the said topic.

Yours truly

[Signature]
TF NORMAN
(Manager SHEQ)