

**PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT  
AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BA-PHALABORWA  
MUNICIPALITY, LIMPOPO PROVINCE**

By

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## DECLARATION

“I declare that the mini-dissertation hereby submitted to the University of Limpopo for the degree of Master of Public Health titled **PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BA-PHALABORWA MUNICIPALITY LIMPOPO PROVINCE** has not previously been submitted by me for a degree at this university or any other university, that it is my work in design and in execution, and that all the material contained herein has been duly acknowledged”.

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**Date**

## **DEDICATION**

I dedicate this work to my dear husband Shaun, my two daughters Ndzalama and Mikhenso for their perseverance during this period of study and their continuous support. I also dedicate this study to my two sisters Zanele and Galelia for their support during data collection period.

God bless you all .

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- Special thanks goes to my research supervisor Dr MP Kekana for his continuous guidance during the entire research period.
- My co-supervisor, Ms M Maphakela for her guidance and advice.
- I also extend my appreciation to Foskor Training Department officer Mrs Dorothy Ledwaba and the procurement section for assisting me with contractors' contacts during my study.
- I also express my heartfelt thanks to all heads of contractors for allowing me to work with their employees.
- I also thank all respondents whose cooperation made this project a success and all other persons that assisted me in the process.

## **ABSTRACT**

The purpose of this study was to determine the provision and utilisation of personal protective equipment amongst contractors in a mine in Phalaborwa Limpopo Province.

A quantitative, descriptive and cross-sectional research approach and design were used to conduct the study. Information was gathered through self-administered questionnaires that were analysed statistically. A cross-sectional study was used to investigate the provision and utilisation of PPE amongst contractors in a phosphate mine. A quantitative research study was conducted using a questionnaire to gather data from contractors working at Foskor mine. Two hundred sixty-one employees responded to the questionnaire.

The findings revealed that contractors were not being provided with PPE hence there is little utilisation of it. They have to buy PPE from their own pockets. Respondents also reported that they were not trained on the use of PPE. The use of PPE among contractors is very low as compared to permanent employees.

### **Conclusions**

The contracted companies were not providing PPE to their employees. As result, PPE was not utilised as required in the mine. The response also indicated that they were not trained in the use of PPE.

**Keywords:** Provision, utilisation, contractors and personal protective equipment.

## **DEFINITION OF CONCEPTS**

### **Contractor**

A person who is hired to perform work or to provide goods at a certain price or within a certain time (Tapiwa, 2015). In the study, a contractor will mean any person who is hired for the period of two to five years to perform work in the mine.

### **Mine**

It refers to a pit or excavation in the earth from which minerals substances are taken (Leskovec, Rajaraman & Ullman, 2014). In the study, a mine means a place where contractors perform their duties in the form of drilling, digging, transportation and grinding.

### **Personal Protective Equipment**

This is any equipment, e.g. hard hats, boots, gloves, masks, respirators, overalls or earplugs that are issued to workers to protect them against occupational injuries and illnesses at the workplace (Department of Mineral Resources, 2015). In the study, PPE will mean any protective equipment provided to contractors by the employer to perform their work without being injured.

### **Provision**

The act of providing or supplying something (Shang, Peng-Zhong, Wen-Tin & Zhi-wei, 2018). In the study, provision will mean the supply of different types of PPE among contractors.

## **LIST OF ABBREVIATIONS**

CMS-	Contractor management system.
CPWR-	Center to Protect Workers' Rights.
DMR-	Department of Mineral Resource
ILO-	International Labour Organisation
MHSA-	Mine Health and Safety Act
NOHS-	National Occupational health and safety.
OHS-	Occupational Health and Safety
OSHA-	Occupational Safety and Health Administration.
PPE-	Personal Protective Equipment
WHO-	World Health Organization.

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## **CHAPTER ONE**

### **OVERVIEW AND BACKGROUND TOI THE RESEARCH STUDY**

#### **1.1. INTRODUCTION AND BACKGROUND**

Mining is an industry that involves the extraction of minerals from the earth that are used for different products (Balasubramanian, 2017). There are two types of mining, surface and underground. The mining industry has for years been linked with diseases, injuries and fatalities due to exposure to mining activities. It has been also linked to environmental pollution, degradation and water contamination with hazardous substances that affect the health of local communities (Swati, Neelam & Rajan, 2014).

During the process of mining, workers are exposed to different hazards that if not controlled could cause harm to health of workers, visitors and the environment. Some of the activities that are undertaken in the mines such as digging of minerals can expose workers to hazardous substances, fumes and dusts (Borges, Barros, Oliveira, Brunherotti & Quemelo, 2016). The produced minerals go through different stages where they are mixed with other minerals and chemical substances to produce different mining products. During this process, workers on the ground also get exposed to different hazardous substances (Borges, Barros, Oliveira, Brunherotti & Quemelo, 2016).

There are general PPE requirements mandate that employers should conduct a hazard assessment of their workplaces to determine hazards that require the use of PPE. The use of PPE is often essential, but is generally the last source of protection when engineering controls, work practices and administrative controls are not effectively mitigating a safe work environment (OSHA, 2009). PPE is designed to protect employees from serious workplace injuries or illnesses that result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.

PPE includes a variety of devices and garments such as face shields, safety glasses, hard hats, safety shoes, coveralls, gloves, earplugs and respirators (OSHA, 2009).

The International Mine Action Standard (IMAS) (2009) indicated that it is the responsibility of the employer and employees to ensure that PPE programmes are effective. The employer should provide PPE for each activity undertaken that meets or exceeds the minimum requirements. PPE should be provided to employees and be appropriate to the risk, local operational procedure and environmental conditions. The employee should use PPE in accordance with the requirement specified by the employer and manufacturer (International Mine Action Standard, 2009).

The International Labour Organisation (ILO) (2012) requires employers to develop workplaces that do not expose workers to any hazards that could harm their health and compromise their safety. To prevent all workers in the mines from exposure to hazardous substances, the employee must wear Personal Protective Equipment (PPE). PPE minimises the risks of being exposed to hazards. For example, wearing hearing protection reduces the likelihood of hearing damage whereby ear plugs or muffs distributed are appropriate for the kind of noise exposure and are used properly (OSHA, 2009). It is the duty of mine owners, contractors and employers to ensure that workplaces and workstations are free from hazards, and workers are protected against hazards at their workplaces or workstations. Furthermore, mine owners or employers are also responsible for the safety of workers of contractors and sub-contractors working within the mine premises (MHSA, 1996).

According to Kalliny and Bassyouni (2011), Egyptian miners exposed to silica dust due to phosphate mining were not provided with PPE and did not have any protection against hazards. Continuous exposure to silica dust without PPE leads to scarring of the lungs, which kill most workers worldwide (Barnes, Goh, Leong & Hoy, 2019). Protective equipment that is mostly used in the mining industries include one for face and eyes, protection for the respiratory system, foot and hand protection and head and ear shields

(Al-Hassan & Amoako, 2014). Bansah and Bekui (2015) further reported that the use of PPE by underground miners in Ghana was ignored.

To prevent exposure to hazards such as noise, dust, falling objects, heat and fumes during phosphate processing, miners use different pieces of PPE. Without PPE, miners are at risks of inhaling dust that is produced during blasting and drilling, and fumes that are produced during heating and smelting of rocks. The noise that is generated from machines and motor vehicles and exposure to chemicals that are used during production and processing of minerals is very high (Borges, Barros, Oliveira, Brunherotti and Quemelo, 2016). Many workers in these mines report to the mine clinic with the following common symptoms: injuries, phlegm, coughing, wheezing, shortness of breath and burns due to absorption of chemicals.

The provision of PPE is essential; especially for high-risk workplaces like mines. It is therefore important that the researcher finds out if workers are provided with PPE in the mines.

## **1.2. RESEARCH PROBLEM**

The researcher observed that contractors who work for a phosphate-producing mine in Phalaborwa are working without proper PPE. Most contract workers are usually seen using PPE from different companies that are not related to the mine. Some borrow PPE from nearby mines and others work without putting on PPE. The mine reported an increasing number of injuries amongst contractors between 2016 (29 reported injuries), 2017 (31 reported injuries) and 2018 (27 reported injuries) (Foskor Reports, 2018). In a study by Pilusa (2008), it was found that the non-provision of PPE to workers was one of the causes of lack of PPE use among mineworkers in mines in Phalaborwa. Lack of PPE provision exposes workers to occupational injuries that could be avoided. It is the duty of the employer to provide workers with protective equipment if workers are working in a hazardous area. The study therefore would like to find out the provision and utilisation of PPE to contractors in a mine in Phalaborwa.

### **1.3. PURPOSE OF THE STUDY**

#### *1.3.1. Aim of the study*

The aim of this study was to determine the provision and utilisation of Personal Protective Equipment amongst contractors in a mine in Phalaborwa, Limpopo Province.

#### *1.3.2. Objectives of the study were.*

- To establish the provision of PPE by the employer and its relevance in the mine.
- To establish PPE training among contractors in the mine.
- To identify the utilisation of PPE among contractors in the mine and their personal beliefs towards it.

### **1.4. RESEARCH QUESTION**

- Are contractors at Phalaborwa mine provided with Personal Protective Equipment?
- How are contractors trained with PPE?
- Are contractors at Phalaborwa mine utilising PPE?

### **1.5. LITERATURE REVIEW**

Literature relevant to the provision and utilisation of PPE by workers, the training on the use of PPE, lack of health and safety training and practice and beliefs on the use of PPE were reviewed and will be discussed fully in chapter 2.

### **1.6. RESEARCH METHODOLOGY**

This account of the methodology is only a summary of what is comprehensively discussed in chapter 3.

#### *1.6.1. Study design*

A quantitative, descriptive and cross-sectional research approach and design were used to conduct the study. Information was gathered through self-administered questionnaires that were analysed statistically. A cross-sectional study was used to investigate the provision and utilisation of PPE amongst contractors in a phosphate mine

### *1.6.2. Study setting*

The study was conducted in a mine in Phalaborwa, Mopani District, Limpopo Province. The mine is located near the confluence of the Ga-selati and the Olifants River halfway along the Western Boarder of Kruger National Park in the Lowveld region. It is a small town that comprises 168 937 people (Statistics SA, 2016). Phalaborwa began as a mining town and is a home to Palabora mining which comprises mines such as Palabora Copper, Foskor, JCI and Bosveld. The mine employs both permanent and contract workers and is one of the suppliers of minerals to international, continental and national industries.

### *1.6.3. Study population and sampling method*

The study population was both male and female contractors who are employed at the Phosphate mine situated in Phalaborwa Limpopo Province. Presently, there are approximately 750 contractors working there. Simple random sampling was used in the study to select contractors working in the mine to participate and to provide them equal opportunities. The sample size of the study was 261.

### *1.6.4. Data collection*

According to Kabir (2016), data collection is a method through which researchers answer their research questions and defend their conclusions and recommendations based on the findings of the study. Data was collected by means of self-administered questionnaires, which are designed specifically to be completed by respondents without the researcher's intervention (Wolf, 2011).

The questionnaire contained closed and open-ended questions, and was written in English because all contractors in the mine can read and write the language.

#### *1.6.5. Data analysis method*

Data was analysed using SPSS version 26. Frequencies and percentages for categorical data and for continuous data summary measures such as mean and standard deviation were used to interpret data. Both t-test and chi-square were used to determine if the assumption made is that of simple random sample that the data was collected from a representative, randomly selected portion of the total population.

### **1.7. BIAS**

According to Simundic (2012), bias is any trend or deviation from the truth in data collection, data analysis, interpretation and publication which can cause false conclusions. In terms of data collection, the researcher piloted the assessment tool at one of the mines before using it to avoid biasness. Information and selection bias was avoided during the study. Information bias was addressed by giving respondents a chance to answer the questionnaires without leading them, and to ensure that the data collected will be about the provision of PPE and nothing else. Selection bias was avoided by using simple random sampling, which is the probability that each participant can be included in the study. There was no unavoidable bias during the study.

### **1.8. ETHICAL CONSIDERATIONS**

Ethical clearance was granted by Turfloop Research and Ethics Committee (TREC). Permission to collect data in the mine was granted by Foskor Training Department. Consent was obtained from respondents prior to data collection.

### **1.9. SIGNIFICANCE OF THE STUDY**

The study might add to existing body of knowledge on the provision of PPE amongst contractors in the mine, as there is a high number of contractors who are working without PPE. Others depend on nearby mines for PPE because they are not being supplied with proper PPE. The study could assist mining companies to come up with ways to solve this problem as well as policy makers on how constructors can be

supplied with proper PPE to avoid occupational injuries that will end up costing production at the mine.

#### **1.10. CONCLUSION**

This chapter introduced the study, problem statement, the purpose and summarised the methodology of how the study was conducted. The contracted companies were not providing PPE to their employees. As result, PPE was not utilised as required in the mine. The issue of training and beliefs also contributed to contractors not using PPE as required. Chapter 2 reviews the literature that is relevant to this study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1. Introduction**

PPE is used to reduce or minimise exposure or contact to injuries at the workplaces. A hazard cannot be eliminated by PPE, but the risk of injury can be reduced. Literature relevant to the provision and utilisation of PPE to contractors in the mines was reviewed and will be discussed below.

#### **2.2. Utilisation of PPE by workers**

Construction is one of the most important industries in South African mining in particular with PPE challenges. Most of the incidents that lead to fatalities or injuries in the construction industry are the result of falls. The falling fatality rate was about 34% of the total attributed to most common accidents in construction in 2010 (CPWR, 2013). This percentage increased in 2012 as the number of fatalities due to falls was 280 out of 775 people killed in industrial construction (Budget for the Bureau of Labor Statistics, 2012). In most of the reported accidents, it was found that workers did not utilise their PPE as expected. The types of PPE that should be utilised in the mines includes the following: safety spectacles, goggles, helmets, safety boots, gloves, ear plugs, protective clothing such as overalls and respiratory masks (Muema, 2016).

Muema (2016) further indicated that 45.2% out of the total workforce of workers in Kenya use PPE. Some of the workers were provided with PPE and yet they were not using it, especially goggles and face masks as observed in this study. These workers said that the PPE was not comfortable. Rose and Rae (2018) reported that the majority of laboratory workers do not utilise PPE. Those who used it did it inconsistently. WHO (2007) in its report indicated that the majority of workers working in welding departments

in various countries were provided with goggles for eye protection but they were not using them properly.

PPE plays an important role in ensuring overall health and safety in construction sites if it is properly utilised by workers (ILO, 2012). Construction site workers continue to have low utilisation of protective clothing in their workplaces. Health and safety managers lacked knowledge about different PPE product specifications, and clothing that would be most suitable for their workplace (Tylor, 2011). If the items of protective clothing are uncomfortable and slow down work process, then they are less likely to be worn, which increases the probability of accidents and heightens the risk that they will suffer injury. On the other hand, if clothes fit properly and do not impede the wearers' ability to do their job, they are much less likely to suffer a costly lapse in concentration or make a potentially lethal mistake (WHO, 2011; ILO, 2012). The PPE should be suited to the environment and properly selected for the individual and task, readily available, clean and functional, correctly used when required and maintained by appropriately trained staff in accordance with PPE maintenance and servicing programme. These programmes should be developed from manufacturers' recommendation in regard to servicing the equipment, if required (Taylor, 2011).

In a study conducted by Acharya (2014), socio-demographic information results showed that majority of respondents were male at 68.4%, but the use of PPE was found higher in female respondents by 31.6% as compared to male respondents. In the same study, the results relating to the perception of workers regarding PPE practices in industry showed that 77.3% of workers do not feel uncomfortable when using PPE, whereas 22.7% workers feel uncomfortable while using PPE in the industry. Most of the workers (89.3%) were encouraged by their colleagues and officers to use PPE, while 10.7% of workers were not encouraged (Acharya, 2014).

## **2.3. Training on the use of PPE**

Before work begins on any contract, all contractor personnel must be given appropriate orientation and induction training, including emergency procedure drills, and to attend to all required hazard training and site-specific orientation and training. All contractor companies must assure that they are in compliance with all regulatory training requirements for each worker by certifying that the training has been completed and that the required documentation is available upon demand. All contractor employees must be able to read and speak the English language sufficiently to allow them to understand and comply with verbal and written safety requirements and instructions, and warning signs and labels; understand and be capable of executing emergency notification and emergency management procedures; bring to the attention of English speaking employees unsafe conditions or actions; and participate in and understand pre-task risk assessments (Kennecott Utah Copper, 2012).

PPE is issued daily most of the time, and 93.3% of respondents indicated that instructions on wearing PPE is the most common type of PPE training that they receive (Tanko & Anigbogu, 2012). In a study conducted by Wanjiku (2017), findings indicated that 63% of motor vehicle repair workers had not received any training on how they could protect themselves from work-related injuries, while 36.3% had received training on how they could protect themselves from work-related injuries. In another study conducted by Maseko (2016), 58% of participants indicated that they did not receive any instruction on how protective clothing should be worn, maintained and stored.

### **2.3.1 Lack of health and safety training amongst workers**

Health and safety training should be planned according to the needs of specific industry and job position. Training plays an important role in the enhancement of performance and the prevention of injuries. It forms the baseline of preventing and removing hazards in the work place. For occupational training to be effective, some of the following elements must be included: environmental safety, labour regulations, performance

safety management and procedure manual of how to operate machinery and electrical equipment, labour protection supplies, previous accidents, dangerous parts and components, toxic items and controls (Legodi, 2015). Most contractors in the mine lack training due to ignorance or non-compliance to what they have been taught, leading to injuries.

According to OSHA (2015), Researchers conclude that those who are new on the job have a higher rate of injuries and illnesses than more experienced workers. To assist employers, safety and health professionals, training directors and others with a need to know, OSHA's training-related requirements have been excerpted and collected in this updated booklet. Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area.

PPE plays an important role in ensuring overall health and safety in construction site if it is properly utilized by workers. Contractors should receive training on how to use PPE provided to them.(OSHA, 2015). The practice of PPE use during work amongst permanent workers was significantly higher as compared to the contract workers (Akintayo, 2013).

#### **2.4. Practices and beliefs on the use of PPE.**

In a study conducted by Akintayo (2013), results indicated that 89% of participants believed that PPE could offer protection if used when working, while 11% believed that PPE use offers no protection from hazards while working. In the same study, 86.3% of participants had positive beliefs in the efficacy of PPE in offering protection from work related hazards, while 13.8% had negative beliefs or did not consider PPE to be effective in offering protection from work-related hazards. The practice of PPE use during work among permanent workers was significantly higher than among temporary workers: 81% versus 18.4% (Akintayo 2013). In the same study, respondents were

allowed to select more than one type of PPE that they had used to protect themselves during resist dyeing process. Among them, 29% of respondents use at least one kind of PPE. 100% of them had absolutely used the respirator, while 27.3% used hand and arm protection. More respondents had a fair level of practice more than a good level of practice.

When used correctly, PPE such as gloves, aprons, eye protection, masks and gowns function as a physical barrier to the transmission of infectious particles present in bodily fluids. It also protects patients from transmission via the contaminated hands or clothing of healthcare staff (Brown, Munro & Rogers, 2019). During the pandemic, staff should always put on their surgical mask, eye protection and they should adhere to social distance more especially when they are not wearing their PPE. They should always practice hand hygiene (Brown et al, 2019).

Many South Africans believes that COVID-19 does not exist, hence the negligence on the use of PPE, other staff believe that they can't afford to use the mask the whole day because it is hot and they are unable to breathe properly.(WHO, 2019).

## **2.5. Provision of PPE among workers**

PPE should be selected with care. The training programme should include selection, maintenance and user training. Supervision should be set to ensure the PPE reduces exposure to hazards which lead to injuries and illness (OSHA, 2009; Taylor, 2011). The principal requirement is that PPE is to be supplied and used because there are risks to health and safety that cannot be adequately controlled in other ways (WHO, 2007). The employer is responsible for ensuring that the PPE provided for use at work is fit for purpose, fit the person and is provided free of charge (OSHA, 2009).

The main requirement of the PPE is that it is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways. The regulations also require that PPE is properly assessed before use to ensure that it

is suitable, maintained and stored properly. It should be provided with instructions on how to use it safely and should be used correctly by employees. Workers must wear protective clothing as a legal requirement (OSHA, 2009).

A study by Muema (2016) on acquisition of PPE found that 23.4% of workers had obtained their PPE by borrowing, while their respective employers provided 14.9%. The remaining 61.7% bought the pieces of equipment by themselves. This shows that majority of the workers bought PPE by themselves. This implies that the contractors have not been taken into consideration in the budget to ensure that safety measures for the workers are put in place. The workers were asked to name the reason for not having the PPE. Most of them cited the cost of the PPE as a problem. This should not be a real problem if employers could adhere to the OSHA regulations or if employees should be educated on their rights or safety conditions as stipulated by OSHA (2009).

In a case study conducted by Mutuma (2010) on the provision of PPE to construction workers, it was found that 54.8% of participants did not have any PPE, while 45.2% confirmed to be in possession of PPE in their respective sites for use during work. A study carried in a sample of 501 male printing workers from 28 factories in Hong Kong indicated that only 22.05% of workers were provided with PPE (Yu et al., 2011).

In a study conducted by Khan, Rehmani and Ahmad (2016), it was found that PPE was provided to only few workers or 6% of stone crushing industry. There was no provision of any PPE to the rest of labourers (94%) working in the polluted industrial environment. This poses great health risk to workers who work in stone crushing industrial area. PPE is considered essential for workers all over the world. There are many organisations which work for the safety of workers and enforce industries to provide them safety and protection equipment (OSHA, 2009). The study showed that 58% of workers never use PPE during work in the industry. According to Khan et al (2016), lack of PPE provision can lead to health problems among workers. In the same study by Khan et al (2016), 82% of workers in the crushing industry were observed to be suffering from hearing

problem. Exposure of workers without PPE to noise causes increased pulse rate, blood pressure, muscle tensing, anxiety, sleeplessness and weakness (Mazurek et al, 2010).

Amongst particle board workers in an Ethiopian wood industry, more workers reported that they did not use PPE because it was not provided to them (Asgedom, Bratveit & Moen, 2019). Most workers are able to use PPE at work only if it is provided to them (Tadesse, Kelayet & Assefa 2016). Occupational accidents and lacerations were reported in small industries of Jeddah in Saudi Arabia due to the unavailability of PPE to workers. Most workers resorted to illegal PPE as a way of protecting themselves against hazards like noise, light and odour (Mansour, Ijaz & Mohammed, 2019). The challenge of unavailability of PPE was reported even amongst public sector workers who were exposed to biological hazards. The workers had to work without any protective equipment (Muraga, Chabeli & Satekge, 2016; Bakibinga, 2012). In cases where PPE was made available, some workers had to pay for it themselves (Nghitanwa, 2016).

The utilization of PPE is not consistent amongst the contractors. The Health and Safety training should be planned according to the needs of specific industry and job position. The practice of PPE use during work amongst the permanent workers was high as compared to contractors. The provision of PPE amongst workers should be selected with care to ensure that it is suitable for the task given to the workers. The following chapter focused on methodology.

## **CHAPTER THREE**

### **METHODOLOGY**

The previous chapter presented literature review. The following chapter outlines how the researcher conducted the study. The following sections were discussed: research method and design, study site, population and sampling procedure, inclusion and exclusion criteria, data collection, data analysis, reliability and validity, bias and ethical considerations.

#### **3.1. Study design**

The study was conducted using the quantitative approach which, according to Mogorosi (2011), is a range of methods which use measurements to record and investigate aspects of social reality. A research design is a plan or structured framework of how you intend to conduct the research process in order to solve the research problem. Research designs can be classified according to whether they are empirical or non-empirical studies (Manganyi, 2015).

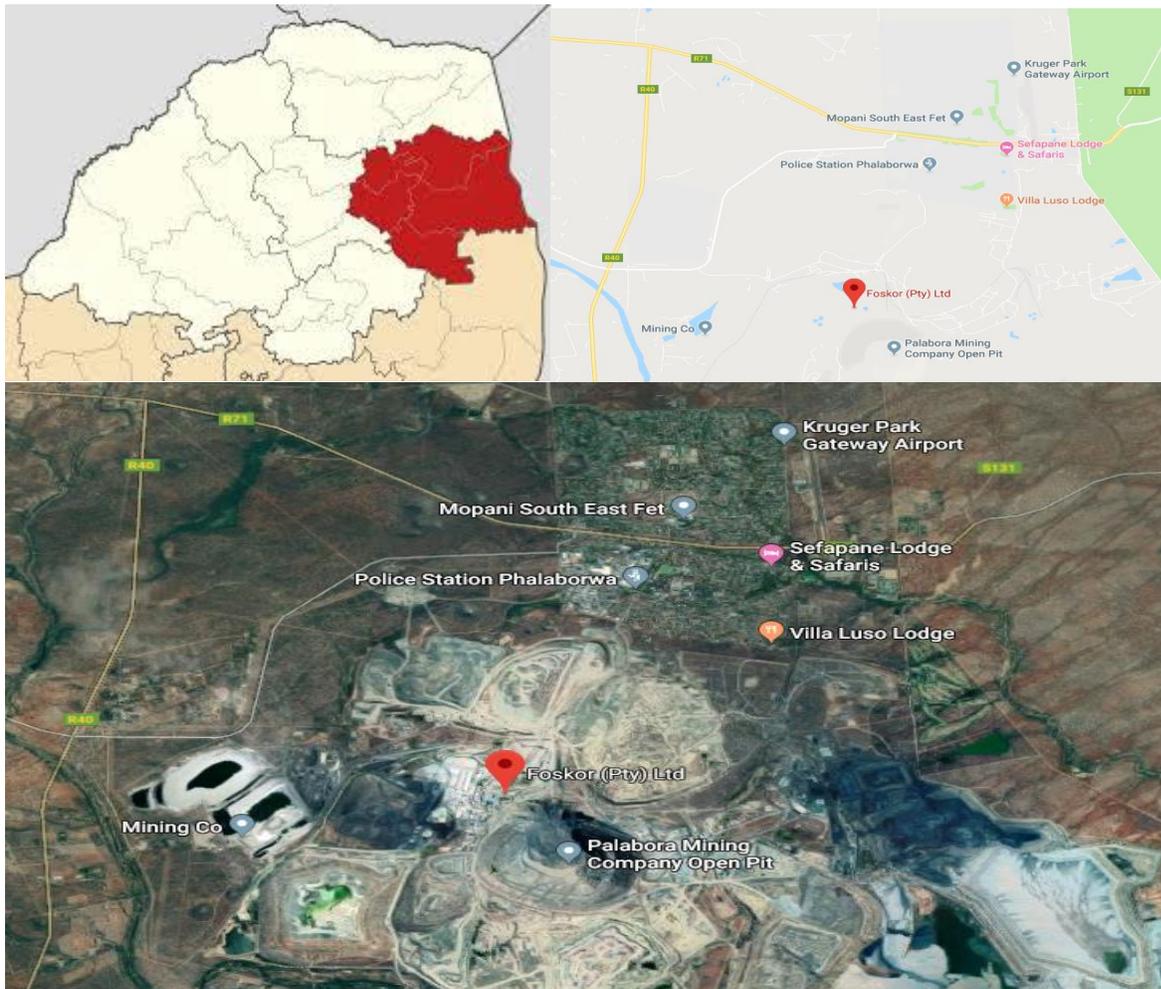
In the study, the quantitative approach was used to investigate the provision and utilisation of PPE amongst contractors in a phosphate mine. For the purpose of this study, data was collected numerically where questionnaires were provided to respondents.

#### **3.2. Study method**

A cross-sectional descriptive study design was used to describe the provision and utilisation of PPE among contractors working in the mine. According to Mogorosi (2011), a cross-sectional descriptive study design is a design where all data is collected at a single point in time. The researcher collected data once using contractors as respondents. For the purpose of this study, a cross-sectional study was applied during self-administered questionnaire to all contractors working in the mine.

### 3.3. Study setting

The study was conducted in a mine in Phalaborwa, Mopani District, Limpopo Province. The mine is located near the confluence of Ga-selati and Olifants River halfway along the Western Border of Kruger National Park in the Lowveld region. It is a small town that comprises 168 937 people (Statistics SA, 2016). Phalaborwa began as a mining town and is a home to Palabora mining, which comprises mines such as Palabora Copper, Foskor, JCI and Bosveld. The mine employs both full time and contract workers and is one of the suppliers of minerals to international, continental and national industries.



**FIGURE 1: Map of Phalaborwa Mines (Foskor, 2018).**

### **3.4. Study population and sampling method**

#### **Population**

Population is the study object and consists of individuals, groups, organisations, human products and events, or conditions to which they are exposed (Manganyi, 2015). For the purpose of the study, population was both male and female contractors who are employed at a phosphate mine situated in Phalaborwa, Limpopo Province. There were approximately 750 contractors working there. Both contractors working at surface and underground formed part of the population of the study. Both skilled and unskilled contractors do Hazard Identification and Risk Assessment (HIRA), which is hazard identification and risk assessment prior to the given task. This requires someone who can read and write. The current minimum requirement in the mining industry is a matric certificate. All respondents were able to read and write.

#### **Sampling**

According to Tuwei (2014), sampling is a process of selecting the 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. For the purpose of the study, the target population were both male and female contractors employed at a phosphate mine situated in Phalaborwa, Limpopo Province.

A probability sampling method/technique was used, where each unit included in the sample had an equal chance of inclusion (Hayes, 2019). This technique provides unbiased and better estimate of the parameters if the population is homogeneous. Probability sampling provides an equal opportunity for each contractor to be selected, thereby ensuring an unbiased representation among contractors. It also has a high level of reliability of research findings and reduces the sampling error (Hayes, 2019). Simple random sampling was used in the study to select contractors to participate. According to Hayes (2019), simple random sampling is used to represent the entire data population. On the study, the sample was selected amongst the contractors who were present on

the data collected day. The benefit of the simple random sampling is that each member of the population has an equal chance of being chosen in the study. Data collected through this sampling method is well informed and reduces any bias.

The researcher used Yamane's formula for sample calculations using the following formula where:

- $n$  is the sample size?
- $N$  is the population size (750)
- $e$  is the sample error (5%) (0.05)

$$n = N / (1 + N(e)^2)$$

$$n = 750 / (1 + 750(0.05)^2)$$

$$n = 750 / 1 + 1.875$$

$$n = 750 / 2.875$$

$$n = 260.87$$

$$n = 261$$

Based on the presented results from the formula, 261 contractors were selected to participate in the study. After the minimum sample size of 261 contractors was calculated, a simple random was conducted in order to select contractors of the study.

### **3.5. Inclusion and Exclusion criteria**

#### **Inclusion criteria**

All the contractors who were employed from one to five years were included because most construction workers work on temporal contractual basis. This was from 2016-2020. Contractors who gave consent for participation and were present on the data collection day were included in the study.

## **Exclusion criteria**

Contractors who did not give their consent and those who were absent on the day of the study were excluded.

### **3.6. Data collection**

According to Kabir (2016), data collection is a method through which researchers answer their research questions and defend their conclusions and recommendations based on the findings of the research. Data was collected by means of questionnaires. A questionnaire, according to Mogorosi (2011), is an instrument and technique of collecting data by means of written questions that the subjects answer in writing, with little (if any) help from the researcher. Questionnaires are cheaper and have standardized answers that make it simple to compile data.

A self-administered questionnaire, which refers to a questionnaire that has been designed specifically to be completed by a respondent without the intervention of the researcher, was used (Wolf, 2011).

The questionnaire contained closed and open-ended questions, and was written in English because all contractors in the mine can read and write the language. The questionnaire was used as a standardised interview to obtain information on the socio-demographic characteristics, the provision, training and use of PPE, and personal beliefs.

### **3.7. Data analysis method**

Data was analysed using SPSS version 26. Frequencies and percentages for categorical data and for continuous data summary measures such as mean and standard deviation were used to interpret data. Both t-test and chi-square were used to determine if the assumption made was correct. Comparison between groups was done using chi-square test for categorical data and t-test for continuous data. P-value of less than 0.05 was considered significant.

### **3.8. Reliability and validity**

#### **Reliability**

According to Korb (2013), reliability means that the findings should be the same if the same instrument is used at different times or administered to different subjects from the same population. The researcher conducted a pilot study at a different mine with similar characteristics as the mine where data was collected. The purpose was to find out if the data collection tool was ready for the actual data collection.

#### **Validity**

The validity of the study, according to Korb (2013), is the degree to which a research study measures what it intends to measure. The researcher ensured that the study was valid by piloting the questionnaires in nearby mine in order to ensure that I get what I want to get. The results of the pilot did not warrant any change on the data collection tool. There are two types of validity that were used in the study.

Content validity refers to the extent to which a research instrument accurately measures all aspects of a construct. The researcher has ensured that the tool addresses the content of the study.

In face validity, experts are asked their opinions about whether an instrument measures the concept intended. The researcher took the tool before data collection to supervisors and the ethics committee to ensure its validation.

### **3.9. Bias**

According to Simundic (2012), bias is any trend or deviation from the truth in data collection, data analysis, interpretation and publication which can cause false conclusions. In terms of data collection, the researcher piloted the assessment tool at one of the mines before using it to avoid biasness. The following bias was avoided

during the study which is information and selection bias. Information bias was addressed by giving respondents a chance to answer the questionnaires without leading them. It ensured that the data collected was about the provision of PPE and nothing else. Selection bias, according to Tripepi, Jager, Dekker and Zoccali (2014), is about the selection of study participants or factors that may affect them. Selection bias was avoided by using simple random sampling which is the probability that each participant can be included in the study. There was no unavoidable bias during the study.

### **3.10. Ethical considerations**

Gray (2009) defines ethics as the study of standards of conduct and values in research, and how these impact on both the researcher and the research subjects. The researcher submitted the research proposal to the Department of Public Health, the School Research Ethics Committee, the Faculty Higher Degrees Committee of the University of Limpopo for approval, and Turfloop Research Ethics Committee (TREC) for ethical clearance (See attached Appendix).

#### **Permission to conduct the study**

Permission to conduct the study was granted from Foskor Mine in Phalaborwa. After approval, the Turfloop Research Ethics Committee (TREC) issued the ethical clearance. The letter for permission to conduct the study is attached (See Appendix).

#### **Informed consent**

According to Gray (2009), informed consent is the obtainment of voluntary participation in a research project based on the full understanding of likely benefits and risks. The researcher explained to respondents the purpose of the study or what the research is about and requested them to freely participate in the study. They were given consent forms to sign before they could take part in the study. The consent form is attached (see the Appendix).

## **Confidentiality**

Confidentiality is viewed as a continuation of privacy, which refers to an agreement that limits other people's access to private information (Babbie & Mouton, 2010). Respondents were informed about the principle of confidentiality. Their identities were protected and the researcher did not use their real names. This was done to make them feel free to participate and to withdraw from the study freely. It also assured them that information will not be shared with anyone.

## **Minimise the risk of harm**

Research should not harm participants involved. If there is any possibility that participants might be harmed or placed in an uncomfortable position, there must be strong justifications for doing so. In the study, harm was minimised by firstly, obtaining informed consent from respondents and by ensuring the principle of confidentiality whereby their real names were not used during the study. Lastly, harm was minimised by explaining to them the right to withdraw from the study if they were not willing to continue (Babbie & Mouton, 2010).

## **Voluntary participation**

It is the participants' rights to freely choose to subject themselves to the scrutiny inherent in research. For the purpose of the study, the researcher allowed respondents to volunteer without force (Gray, 2009).

## **Anonymity**

In this study the researcher ensured that information that was provided by respondents was kept confidential and anonymous. Data collected did not contain any identifiable information that will be linked to respondents (Gray, 2009).

## **Right to withdraw**

During the period of the study, individuals had the right to choose to participate or not to participate. Also, an individual who initially agrees to participate has the right to withdraw from the study at any point and to refuse to answer any particular question or to participate in a particular set of procedures (Schafer, Weitheimer & Kennedy, 2010).

## **3.11. Conclusions**

This chapter presented how the researcher conducted the actual study. It further outlined the research method and design employed during data collection. It also outlined the study setting, sampling population, data collection, data analysis, pilot testing, validity, reliability, bias and ethical considerations. The following chapter presents and interpret the study results.

## CHAPTER FOUR

### PRESENTATION AND INTERPRETATION OF THE RESULTS

#### 4.1. Introduction

The previous chapter discussed the research methodology that encompasses the research design, study setting, study population, sampling method, inclusion and exclusion criteria, the data collection method, data analysis, reliability and validity, bias and ethical considerations. This chapter presents and interprets results of the study.

This chapter comprises the following subsections: (1) demographic data that includes age, gender, marital status, race, highest level of education, occupation and number of years that respondents have been in the company; (2) the provision of Personal Protective Equipment (PPE), (3) training, utilisation and beliefs regarding the PPE.

#### 4.2. Demographic characteristics of the participants

A total of 261 contractors participated in the study. Figure 1 presents the age distribution of participants. 7(2.7%) participants were in the age group of 20-25 years, followed by 50 (19.2%) in the age of 26-30 years, 70(26.8%) were in the age group of 31-35 years, 57 (21.8%) in the age group of 36-40 years, 42 (16.1%) in the age group of 41-45 years while only 35(13.4%) were in the age group of 46 and above.

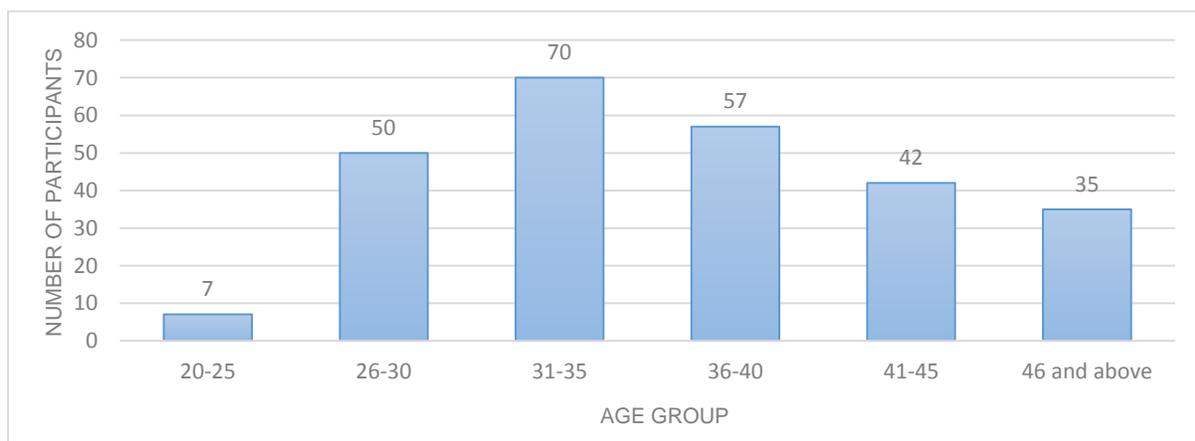


Figure 2: Age distribution.

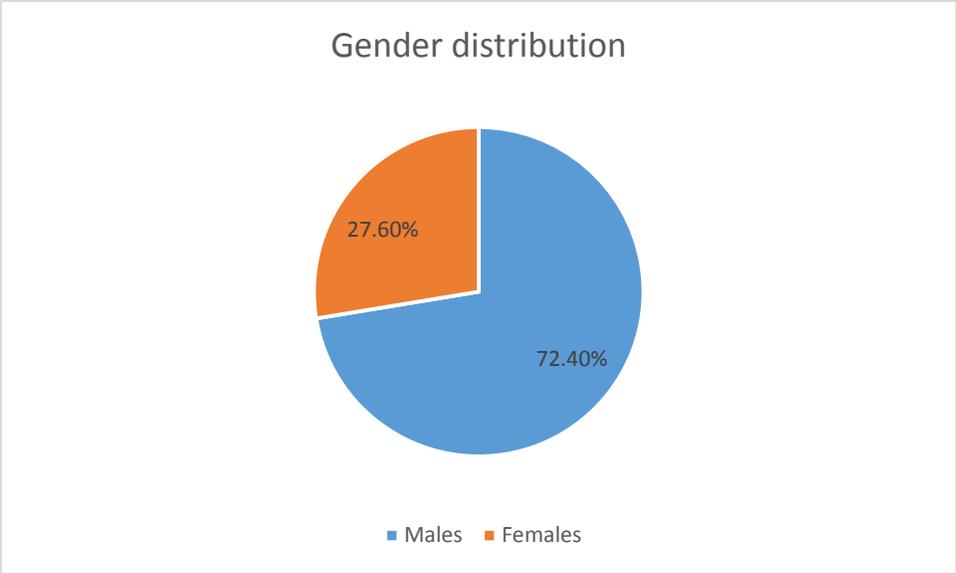
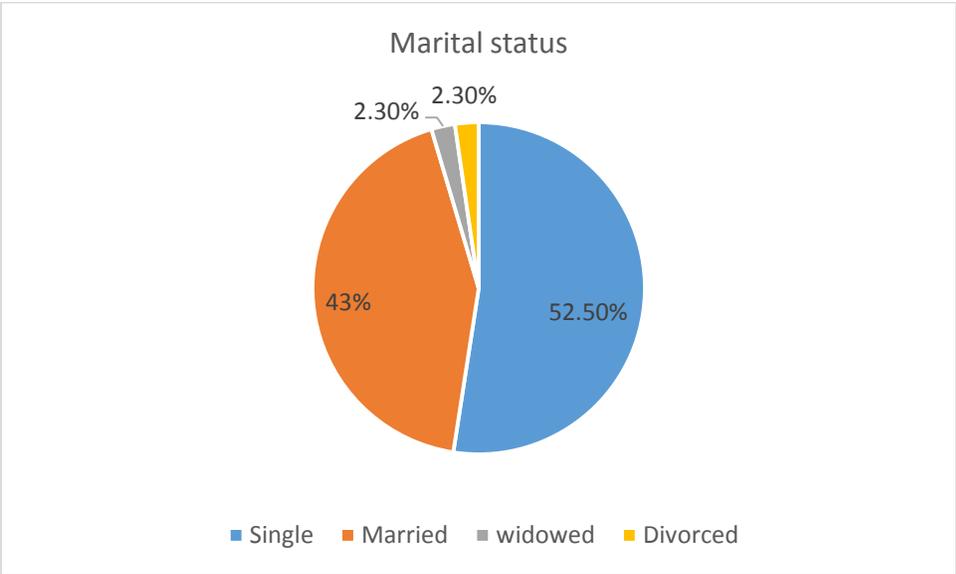


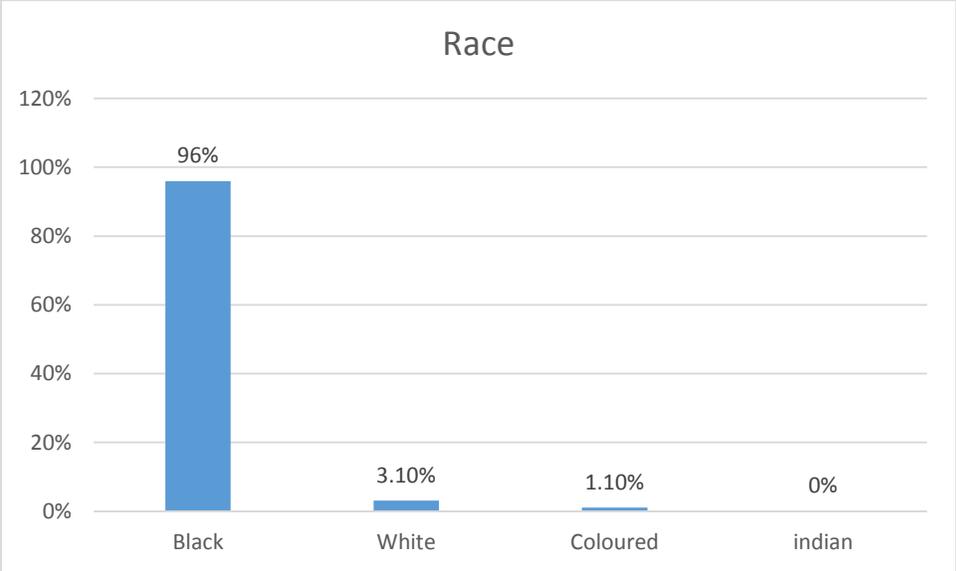
Figure 3: Gender distribution.

Figure 2 presents the gender distribution of the study participants. The majority (72.4%) of respondents were male as compared to only 27.6 female.



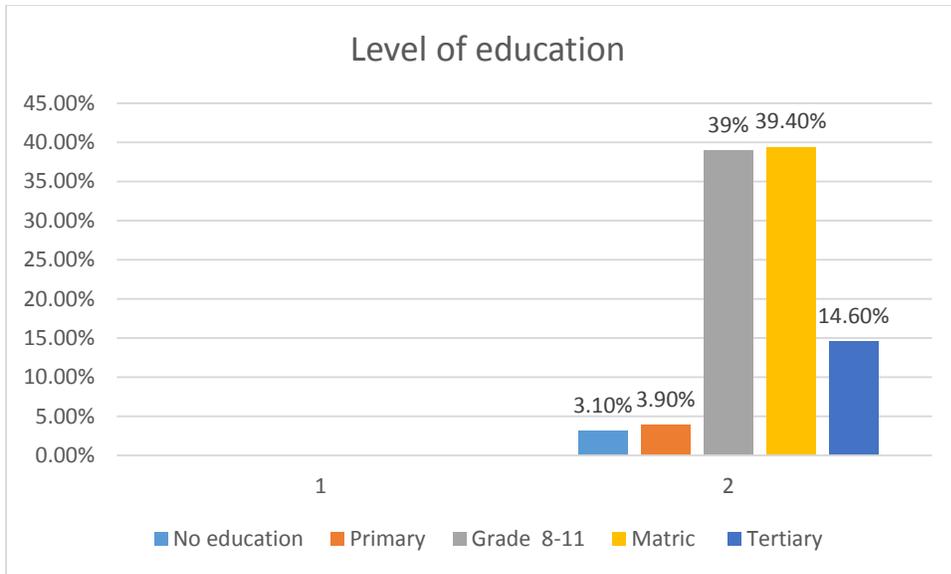
**Figure 4:** marital status distribution.

The majority (52.5%) of respondents were single followed by married respondents (43%), while only 2.3% of respondents were widowed and divorced respondents



**Figure 5:** Race distribution

The majority 96% (250/261) of respondents were blacks followed by white respondents at 3.1% (8/261), while only 1.1% (3/261) respondents were coloured.



**Figure 6:** Highest level of education

The majority 39.4% (103/261) of respondents were those with matric followed by grade 8-11 at 39%(102/261), while 14.6%(38/261) had tertiary education, 3.8% (10/261) had primary education, and 3.1% (8/261) had no education.

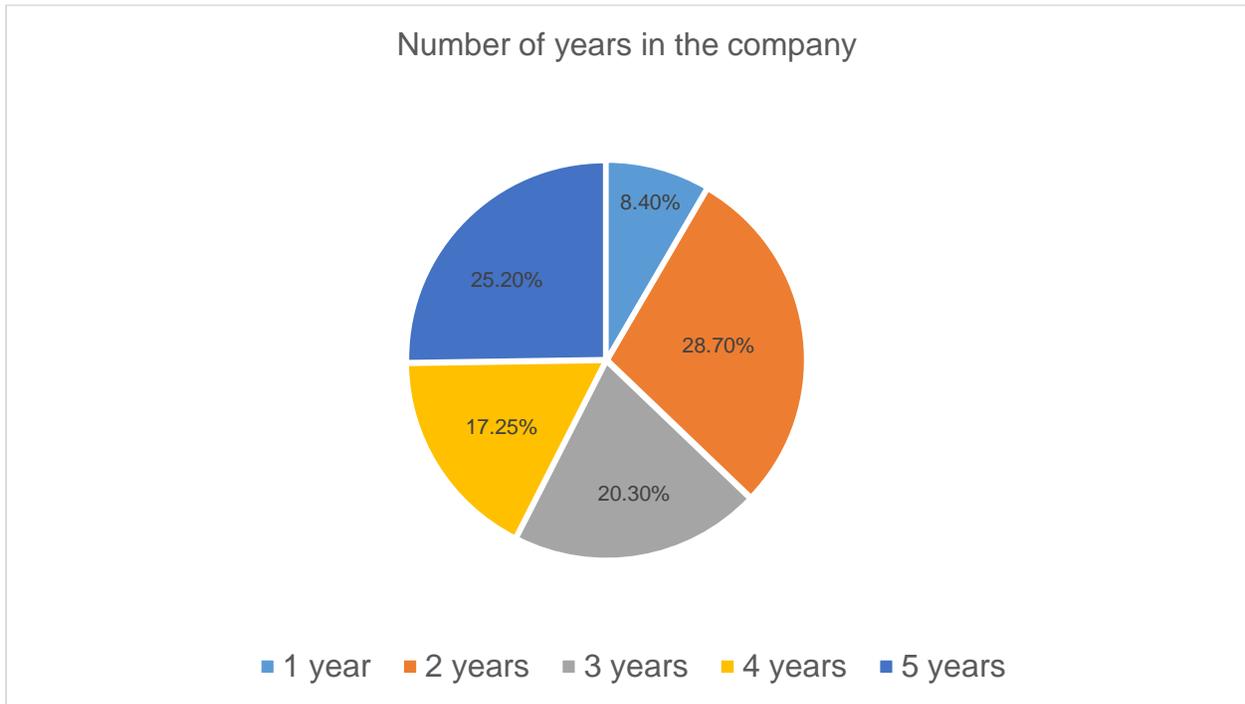
**Table 4.1:** Occupational distribution of respondents

OCCUPATION	NUMBER	PERCENTAGE
General worker	48	18.4%
Labor	48	18.4%
Cleaner	41	15.8%
Operator	22	8.4%
Boiler maker	14	5.3%
Scaffold erector	14	5.3%
Auto electrician	11	4.2%
Plumber	11	4.2%

Fitter	10	4%
Artisan	9	3.4%
Welder	8	3%
Semi-skilled	5	2%
Driver	5	2%
Finance	3	1.1%
Civil	3	1.1%
Unskilled	2	0.8%
Supervisor	2	0.8%
Technical operator	2	0.8%
Carpenter	1	0.4%
Messenger	1	0.4%
Builder	1	0.4%
<b>Total</b>	<b>261</b>	<b>100%</b>

The majority (18.4%) of respondents were general workers, followed by labourers at 18.4% as well, while 15.8% were cleaners. 8.4% of respondents were operators, 5.3% boiler makers, 5.3% scaffold erectors, 4.2% were auto electricians, 4.2% plumbers, 4% fitters, 3.4% artisans, 3% were welders, 2% semi-skilled workers, 2% were drivers, 1.1% of the respondents were working at finance, followed by civil workers at 1.1%, 0.8% unskilled workers, 0.8% supervisors, 0.4% messengers and 0.4% of respondents were builders and carpenters.

**Figure 7:** Total number of years in the company distribution



The majority (28.7%) of respondents had two years’ experience. This was followed by 25.2% with five years’ experience in the company. 20.3% of the respondents had three years’ experience, 17.2% had four years’ experience, and lastly 8.4% of respondents had one year experience of working in the company.

### 4.3. Provision of PPE.

**Table 4.2:** Percentage distribution of respondents with regard to the provision of PPE

<b>My employer provides us with gloves</b>	<b>Number</b>	<b>Percentage</b>
Agree	130	49.9%
Disagree	131	50.1%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with hard hats</b>		
Agree	136	52.1%

Disagree	125	47.9%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with safety boots</b>		
Agree	130	49.9%
Disagree	131	50.1%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with shields</b>		
Agree	85	32.6%
Disagree	176	67.4%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with hearing muffs/ear plugs</b>		
Agree	106	40.7%
Disagree	155	59.3%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with respiratory masks</b>		
Agree	90	34.4%
Disagree	171	65.6%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>The PPE that is provided to us is relevant to my work</b>		
Agree	118	45.2%
Disagree	143	54.8%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides with PPE when it is worn out</b>		
Agree	105	40.2%
Disagree	156	59.8%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My employer provides us with PPE once a year</b>		
Agree	129	49.4%
Disagree	132	50.6%
<b>Total</b>	<b>261</b>	<b>100%</b>

<b>My employer provides us with PPE quarterly</b>		
Agree	26	10%
Disagree	235	90%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I buy my own PPE</b>		
Agree	164	62.9%
Disagree	97	37.1%
<b>Total</b>	<b>261</b>	<b>100%</b>

The results in Table 4.2 indicate the percentage distribution on the provision of PPE. The results showed that most respondents 50.1% (131/261) were not being provided with gloves. Furthermore, the majority 52.1% (136/261) of respondents agreed that they are provided with hard hats. More than half of the respondents 50.1% (131/261) reported that the employer does not provide them with safety boots while the remaining 49.8% (130/261) agreed to have been provided with safety boots.

Furthermore, 67.4% (176/261) indicated that the employer does not provide them with face shields. With regards to the provision of hearing muffs/ear plugs, the results showed that most respondents at 59.3% (155/261) were not provided. The results of majority of respondents at 65.6% (171/261) showed that they were not being provided with respiratory masks. However, most of the respondents at 54.8% (143/261) reported that the PPE that was provided was not relevant to their work.

The results of the majority of respondents at 59.8% (156/261) showed that the employer does not provide PPE when it is worn out. However, with 132 of respondents, the results showed that they are not being provided with PPE once a year, while 90% (235/261) of respondents indicated that they were also not being provided with PPE quarterly either. Lastly, with 62.9% (164/261) of respondents, results showed that most of the contractors were buying their own PPE.

#### 4.4. Training, utilisation and beliefs regarding PPE

**Table 4.3:** Percentage distribution of respondents with regard to PPE training

<b>I was trained on how to use gloves</b>	<b>Number</b>	<b>Percentage</b>
Agree	121	46.3%
Disagree	140	53.7%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I was trained on how to use hard hats</b>		
Agree	108	41.3%
Disagree	153	58.7%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I was trained on how to use safety boots</b>		
Agree	116	44.4%
Disagree	145	55.6%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I was trained on how to use shields</b>		
Agree	79	30.2%
Disagree	182	69.8%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I was trained on how to use hearing muffs/ear plugs</b>		
Agree	99	38%
Disagree	162	62%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I was trained on how to use respiratory masks</b>		
Agree	92	35.2%
Disagree	169	64.8%
<b>Total</b>	<b>261</b>	<b>100%</b>

The results in Table 4.3 showed the percentage distribution of respondents with regard to PPE training. The results showed that most of the respondents 53.7% (140/261) were not trained on how to use gloves, with 58.7% (153/261) of the respondents reporting

that they were also not trained on how to use hard hats. 55.6% (145/261) of the respondents indicated that they were not trained on how to use safety boots while results of 69.8% (182/261) of the respondents showed that they were also not trained on how to use shields.

Furthermore, 62% (162/261) of the respondents reported that they were also not trained on how to use hearing muffs/ear plugs. Lastly, results of 64.8% (169/261) of the respondents showed that they were also not trained on how to use respiratory masks at their workplace.

**Table 4.4:** Percentage distribution of respondents with regards to the use of PPE and personal beliefs

<b>I use PPE frequently</b>	<b>Number</b>	<b>Percentage</b>
Agree	218	83.5%
Disagree	43	16.5%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I use PPE only when I see the supervisor</b>		
Agree	47	18%
Disagree	214	82%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I use PPE when I anticipate danger</b>		
Agree	77	29.5%
Disagree	184	70.5%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>I do not like using PPE</b>		
Agree	19	7.3%
Disagree	242	92.7%
<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My culture does allow me to put on PPE</b>		
Agree	100	38.3%
Disagree	161	61.7%

<b>Total</b>	<b>261</b>	<b>100%</b>
<b>My religion prohibits from wearing some PPE</b>		
Agree	22	8.4%
Disagree	239	91.6%
<b>Total</b>	<b>261</b>	<b>100%</b>

The results in Table 4.4 showed the percentage distribution of respondents with regards to the use of PPE and personal beliefs. The results of the majority of respondents at 83.5% (218/ 261) showed that they were using PPE frequently, with 82% (214/ 261) of the respondents indicating that they were not using PPE when they see the supervisor.

Furthermore, results of 70.5% (184 /261) of the respondents showed that they were not using PPE when they anticipated danger, with 92.7% (242 /261) of them indicating that they do like using PPE as compared to N=19 who did not. However, 61.7% (161 /261) of the respondents reported that their culture does not allow them to put on PPE. Lastly, 91.6% (239 /261) of the respondents reported that their religion does not prohibit them from wearing some of the PPE.

## **CHAPTER FIVE**

### **DISCUSSION OF MAJOR FINDINGS**

#### **5.1. INTRODUCTION**

This chapter deals with discussion of major findings as presented in chapter 4. The findings were presented in tabular and graph format. Due to this findings demographic information, provision of PPE, training, utilization and beliefs and the use of PPE had been restated.

#### **5.2. RESTATEMENT OF THE PROBLEM**

The researcher observed that contractors who work for a phosphate-producing mine in Phalaborwa are working without proper PPE. Most contract workers are usually seen using PPE from different companies that are not related to the mine. Some borrow PPE from nearby mines and others work without putting on PPE. The mine reported an increasing number of injuries amongst contractors between 2016 (29 reported injuries), 2017 (31 reported injuries) and 2018 (27 reported injuries) (Foskor Reports, 2018). In a study by Pilusa (2008), it was found that the non-provision of PPE to workers was one of the causes of lack of PPE use among mineworkers in mines in Phalaborwa. Lack of PPE provision exposes workers to occupational injuries that could be avoided. It is the duty of the employer to provide workers with protective equipment if workers are working in a hazardous area. The study therefore would like to find out the provision and utilisation of PPE to contractors in a mine in Phalaborwa.

#### **5.3. RESTATEMENT OF THE PURPOSE OF THE STUDY**

The purpose of study was to determine the provision and utilisation of Personal Protective Equipment amongst contractors in a mine in Phalaborwa, Limpopo Province.

#### **5.4. RESTATEMENT OF THE OBJECTIVES OF THE STUDY**

The Objectives of the study were:

- To establish the provision of PPE by the employer and its relevance in the mine.
- To establish PPE training among contractors in the mine.
- To identify the utilisation of PPE among contractors in the mine and their personal beliefs towards it.

#### **5.5. DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS.**

##### **Age distribution**

In a study by Acharya (2014) in Nepal, it was found that majority of construction workers were in the age group between 30-40 years and were more likely to use PPE compared to others.

##### **Gender distribution**

Most often than not, work in construction sites require strength and masculinity. That is why it attracts more males than females as seen in this study. Hard work with high occupational risk is always done.

##### **Marital status distribution**

It is evident that all people, despite their marital status, are able to work in the construction industry.

##### **Race distribution**

The reason for the large number of blacks is that Phalaborwa is most dominated by blacks as compared to other races.

##### **Highest level of education distribution**

A similar study by Acharya (2014) on PPE utilisation among construction workers also found that the majority of respondents (87.1%) were literate, hence this concurs with the results of this study.

### **Occupation distribution**

The majority (18.4%) of respondents were general workers, followed by labourers at 18.4% as well, while 15.8% were cleaners. 8.4% of respondents were operators, 5.3% boiler makers, 5.3% scaffold erectors, 4.2% were auto electricians, 4.2% plumbers, 4% fitters, 3.4% artisans, 3% were welders, 2% semi-skilled workers, 2% were drivers, 1.1% of the respondents were working at finance, followed by civil workers at 1.1%, 0.8% unskilled workers, 0.8% supervisors, 0.4% messengers and 0.4% of respondents were builders and carpenters.

### **Total number of years in the company**

The findings shows that newly employees tend to comply with the use of PPE while employees who have 3 to 5 years of experience tend not to adhere with the utilizing of PPE due to complacency.

### **5.6. PROVISION OF PPE**

Based on the results above, it can be concluded that contracted companies were not providing their employees with gloves and safety boots. Potential hazards that might occur because of lack of gloves include absorption of harmful substances which might lead to hand injuries in the future. Contractors must at all times wear their foot and leg protection whenever they are inside the working premises because workers are at risk of possible foot or leg injuries from falling, rolling objects, crushing or penetrating materials such as nails which may cause serious injuries in the foot.

In a study conducted by Muema (2016), only 2% were provided with gloves, 10% with helmets and 5% were provided with safety boots. The results showed that the majority were at risk of being injured. In the same study (45.25%), respondents reported that the utilisation of PPEs was low because contractors did not provide these.

Injuries caused by not wearing eye and face protection include losing sight and face injuries due to acids. Due to the employer failing to provide contractors with hearing muffs, employees could suffer from infection of the ear and deafness. Respiratory

masks are used to protect workers from being exposed to gases. Failure to provide workers with masks can lead to illnesses such as tuberculosis and bronchitis, which might lead to fatalities.

In a study by Acharya (2014), wearing hearing protection reduces the likelihood of hearing damage when the ear plugs or muffs are appropriate for the kind of noise exposure and are used properly. The same study results showed that 69.2% of workers were not provided with respiratory masks in a construction site. In a similar study by Muema (2016), a total of 6(46.2%) construction sites had PPE that match the purpose in their respective sites while 7(53.8%) had PPE that did not match the hazards. In the same study, 5(38.5%) construction sites had face/ eye protection while 8(61.5%) did not have these kinds of PPE.

The provision of PPE is the selection and supply of PPE to workers in order to reduce exposure to hazards which can lead to injuries and illnesses. Based on the presented results, the employer does not provide full kit of PPE to their employees, and with those who are provided, the PPE is not in good condition. the results also showed that the majority of workers (62.9%) buy their own PPE, of which it is against the law because according to OSHA (2009), it is stated that the employer is responsible for providing workers with PPE free of charge. If workers are not provided with proper PPE that fits their job, it can lead to exposure to hazards which can result in injuries, illnesses or fatalities.

In study conducted by Acharya (2014), 61.7% of the respondents show that the majority of workers from all the construction sites bought PPE by themselves. This implies that the contractors have not budgeted safety measures for their workers.

Based on the results, 58.8% of workers reported that the PPE provided is not relevant to their job. This can simple means that the PPE provided is not properly assessed before use to ensure that it is suitable for the job. Most workers were provided with PPE when it is worn out, which shows that they do not provide according to the job specification.

## **5.7. TRAINING, UTILIZATION AND BELIEFS REGARDING PPE**

The results above showed that the majority of contractors working in the mine were not trained on the use of PPE. Training is the responsibility of the employer who should give appropriate orientation and induction on the use of PPE. Those who were provided also did not have knowledge with regard to the use of PPE and its relevance. Lack of training in the workplace can lead to serious injuries which can result in fatalities.

In a study by Muema (2016) on the training of construction workers about the use of PPE, the study showed that 79(76%) participants had never undertaken any safety training especially on the use of PPE in construction sites. In the same study, it was revealed that lack of safety training and PPE use increases the odds of injuries among construction workers. Safety training especially on the use of PPE is very important among construction workers. This is because their work involves a lot of hazards, and most of them have secondary education or below as reported earlier in this study. Any industry which involves high risk activities like construction work should practise safety culture.

## **5.8. USE OF PPE AND PERSONAL BELIEFS**

The utilisation of PPE is important in the workplace such as mines. Based on the results, 83.5% of workers were using PPE frequently regardless of the employer failing to provide it. The contractors ensured that they utilise the PPE provided, including and those that they bought with their money. Most contractors were using PPE when they anticipated danger that could lead to fatalities or injuries. The results also showed that 61.7% of workers were prohibited to put on PPE by their culture but with regard to religion, the majority (91.6%) of workers were not prohibited from wearing PPE. This proves that workers can use PPE correctly only if the employer provides.

Most workers are able to use PPE at work only if it is provided to them (Tadesse, Kelayet & Assefa 2016). Occupational accidents and lacerations were reported in small

industries of Jeddah in Saudi Arabia due to the unavailability of PPE to workers. Most workers resorted to illegal PPE as a way of protecting themselves against hazards like noise, light and odour (Mansour, Ijaz & Mohammed, 2019).

In the same study by Acharya (2014), 86.3% of participants had positive beliefs in the efficacy of PPE in offering protection from work-related hazards while 13.8% had negative beliefs or did not consider PPE to be effective in offering protection from work-related hazards. The practice of PPE use during work among permanent workers was significantly higher than among temporary workers with 81% vs 18.4%. (Akintayo 2013).

## **5.9. LIMITATIONS OF THE STUDY**

- Due to Covid 19, the researcher was unable to meet the contractors at once. This might have caused respondents to influence one another.
- The presence of the supervisor might have influenced respondents to provide responses that pleased the supervisor.
- Some of the respondents did not respond to all questions. This might have influenced the results or limited the possibility of generalising findings.

## **5.10. CONCLUSIONS**

The purpose of the study was to establish the provision of PPE, its relevance, training and personal beliefs and to establish the utilisation of PPE amongst contractors in a mine in Phalaborwa.

The following conclusions were drawn from the findings:

The respondents indicated that contractors or construction companies did not provide their employees with the required PPE relevant to their job. They further reported that lack of provision of PPE has led employees to buy their own PPE which, according to Acharya (2014), means that contractors have not taken into consideration in their budget safety measures for workers to provide them with PPE.

The findings also revealed that the majority of employees were not trained on the use of PPE. This has also been supported by a study conducted by Muema (2016), that lack of training in the workplace can lead to serious injuries which can result in fatalities.

The respondents also reported that they were using PPE that they bought for themselves frequently, although some of the PPE that they bought was not of the right quality. The findings also revealed that the majority of employees like using PPE. Unfortunately, they are not provided with it. The use of PPE among contractors is very low as compared to permanent employees in the mine because they have incomplete PPE.

### **5.11. RECOMMENDATIONS**

- The provision of PPE among contractors working in the mine must be intensified. At least, they must be provided with it once a year.
- Mine management team must be involved in the health and safety programme of contractors in order to ensure that the provision of PPE takes place and to give support where necessary.
- Officials of the ministry of labour should implement OSHA (2007), especially in the provision of free PPE to all workers.
- Construction site management must implement PPE training and education to all contractors working in the mine.
- Health and safety representatives should monitor the use of PPE and encourage the use of PPE amongst contractors.
- Prizes can be awarded to the most complying construction company in order to encourage the provision and utilisation of PPE at their workplace.

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## APPENDICES

### Appendix 1: Ethics committee clearance certificate.



**University of Limpopo**  
Department of Research Administration and Development  
Private Bag X1106, Sovenga, 0727, South Africa  
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

**TURFLOOP RESEARCH ETHICS COMMITTEE**  
**ETHICS CLEARANCE CERTIFICATE**

**MEETING:** 16 September 2020

**PROJECT NUMBER:** TREC/183/2020: PG

**PROJECT:**

**Title:** Provision and Utilisation of Personal Protective Equipment Amongst Contractors at A Mine in Phalaborwa, Ba-Phalaborwa Municipality Limpopo Province  
**Researcher:** G Mhlongo  
**Supervisor:** Mr MP Kekana  
**Co-Supervisor/s:** Ms MP Maphakela  
**School:** Health Care Sciences  
**Degree:** Master of Public Health

**PROF P MASOKO**  
**CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE**

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

**Note:**

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

*Finding solutions for Africa*

**Appendix 2: Letter to Department of Mineral Resource**

**P.O. BOX 21**

**Lulekani**

**1392**

**13 May 2020**

**The Head of Department**

**Limpopo Department of Mineral resources**

**Private Bag X9467**

**Polokwane**

**0700**

**Re: REQUEST TO CONDUCT RESEARCH ON PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BA PHALABORWA MUNICIPALITY LIMPOPO PROVINCE.**

**My name is Genesa Mhlongo, a Public Health masters student at the University of Limpopo (Turfloop campus). I am conducting a study on PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BA PHALABORWA MUNICIPALITY LIMPOPO PROVINCE.**

**I hereby apply to be granted permission to conduct this research at Phalaborwa mines (FOSKOR) under the Department of Mineral Resources. To ensure confidentiality, privacy and anonymity of respondents, there will be no names and identities provided in the research project.**

**The method of data collection to be used will be self-administered questionnaires and will consist of demographic characteristics, provision of PPE, PPE training, use of PPE and personal beliefs.**

**Yours faithfully**

---

**Ms. Mhlongo G**  
**(Masters student)**

**Date:** \_\_\_\_\_

---

**Mr. Kekana M.P**  
**(Supervisor)**

**Date:** \_\_\_\_\_

**Appendix 3: Letter to the Mine.**

**P.O.BOX 21**

**Lulekani**

**1392**

**06. May 2020**

**The Manager**

**SHEQ Department (Foskor Mine)**

**PO Box 1**

**Phalaborwa**

**1390**

**Dear Sir/ Madam**

**APPLICATION TO CONDUCT A RESEARCH STUDY AT YOUR INSTITUTION**

**I hereby apply to conduct a research study at your institution as part of my study towards a Master's of Public Health Degree.**

**The topic of my research is PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BA PHALABORWA MUNICIPALITY LIMPOPO PROVINCE.**

**The reason for my research is to find out how often contractors are provided with PPE and utilisation of Personal Protective Equipment in the mines. The study could assist mining companies to come up with ways to solve this problem as well as policy makers on how constructors can be supplied with proper PPE to avoid occupational injuries that will end up costing production in the mine.**

**I will be grateful if my request can be granted.**

**Yours faithfully**

---

**Ms. G. Mhlongo**

## Appendix 4: Letter from the Mine.



FOSKOR (Pty) Ltd  
Reg No: 199/002986/07  
Physical Address:  
27 Seleni Road  
Phalaborwa 1360  
Postal Address:  
PO Box 1  
Phalaborwa 1360  
South Africa  
Tel: +27 (0)11 388 2000  
Fax: +27 (0)11 388 2080  
Email: [enquiries@foskor.co.za](mailto:enquiries@foskor.co.za)  
[www.foskor.co.za](http://www.foskor.co.za)

Enquiries:  
Our Ref:  
Your Ref:

18 November 2020

Genesa Mhlongo

Dear Madam

**Genesa Mhlongo - Research**

Thank you for your request for conducting research on Provision and Utilisation of Personal Protective Equipment Amongst Contractors in the mine. Though we cannot allow you to physically enter the mine, you may contact the following contractors that are employed by Foskor directly:

Alvar Trading – (Rachel) – 0828020636

Vakanayena – (Kenny / Abigail) – 0737878885 / 0832828001

Just The Phee – (Julio / Pheladi) – 0717298634

Petmery – (Alta/Petrus) - 082 805 8717

Vexovax – (Freddy) - 078 941 5925

Homu's Environmental – (Trevor) – 0827666908

MJM Electrical (Larry) 072 010 1564

Yours faithfully

  
M D LEDWABA  
TALENT MANAGEMENT SPECIALIST

DIRECTORS: Mr M M Gabaali (Chairman), Mr CC Potlamo (President/CEO), Mr JT Phelele (CFO), Mr N V B Magubane, Mr SP Muthi, Mr SP Ngwenya, Mr VO Nkwa, Mr V Rasechane (India), Mr TML Setlhoana, Ms M J Nkomo, Ms ALEB Khanyile (Company Secretary)



## Appendix 5: Self-administered questionnaire

### SECTION 1: DEMOGRAPHIC DATA

Please fill in by marking with a cross (X) in the box of your choice.

1.1 Age

Age group	<input checked="" type="checkbox"/>
20 -25	<input type="checkbox"/>
26-30	<input type="checkbox"/>
31-35	<input type="checkbox"/>
36-40	<input type="checkbox"/>
40-45	<input type="checkbox"/>
46 and above	<input type="checkbox"/>

1.2 Gender:

<input type="checkbox"/> Male	<input type="checkbox"/> Female
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1.3 Marital status:

<input type="checkbox"/> Single	<input type="checkbox"/> Married	<input type="checkbox"/> Widowed	<input type="checkbox"/> Divorced
---------------------------------	----------------------------------	----------------------------------	-----------------------------------

1.4 Race:

<input type="checkbox"/> Black	<input type="checkbox"/> White	<input type="checkbox"/> Colored	<input type="checkbox"/> Indian
--------------------------------	--------------------------------	----------------------------------	---------------------------------

1.5 Highest level of education:

<input type="checkbox"/> No education	<input type="checkbox"/> Primary	<input type="checkbox"/> Grade 8-11	<input type="checkbox"/> Matric	<input type="checkbox"/> Tertiary
---------------------------------------	----------------------------------	-------------------------------------	---------------------------------	-----------------------------------

1.6 Occupation:

1.7 Total number of years in the company:

<input type="checkbox"/> 1 year	<input type="checkbox"/> 2 years	<input type="checkbox"/> 3 years	<input type="checkbox"/> 4 years	<input type="checkbox"/> 5 years
---------------------------------	----------------------------------	----------------------------------	----------------------------------	----------------------------------

### SECTION 2: PROVISION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

Please fill in by marking with a cross (X) in the box of your choice.

Provision of PPE

Please tick

	Agree	Disagree
1. My employer provides us with gloves	<input type="checkbox"/>	<input type="checkbox"/>
2. My employer provides us with hard hats	<input type="checkbox"/>	<input type="checkbox"/>
3. My employer provides us with safety boots	<input type="checkbox"/>	<input type="checkbox"/>
4. My employer provides us with shields	<input type="checkbox"/>	<input type="checkbox"/>
5. My employer provides us with hearing muffs/ear	<input type="checkbox"/>	<input type="checkbox"/>

plugs		
6. My employer provides us with respiratory masks		
7. The PPE that is provided to us is relevant to my work.		
8. My employer provides with PPE when it is worn out		
9. My employer provides us with PPE once a year		
10. My employer provides us with PPE quarterly		
11. I buy my own PPE		

**SECTION 3: TRAINING, UTILISATION AND BELIEFS REGARDING THE USE OF PPE**

Please fill in by marking with a cross(X) in the box of your choice.

**PPE training**

**Please tick**

	<b>Agree</b>	<b>Disagree</b>
1. I was trained on how to use gloves		
2. I was trained on how to use hard hats		
3. I was trained on how to use safety boots		
4. I was trained on how to use shields		
5. I was trained on how to use hearing muffs/ear plugs		
6. I was trained on how to use respiratory masks		

**Use of PPE and personal beliefs**

**Please tick**

	<b>Agree</b>	<b>Disagree</b>
1. I use PPE frequently		
2. I use PPE only when I see the supervisor		
3. I use PPE when I anticipate danger		
4. I do not like using PPE		
5. My culture does allow me to put on PPE		
6. My religion prohibits from wearing some PPE		

## **Appendix 6: Informed consent**

### **PART A: Informed consent**

#### **Participant/caregiver consent form**

(For each participant/caregiver, please read and understand the document before signing)

**Research title: PROVISION AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONGST CONTRACTORS IN A MINE IN PHALABORWA, BAPHALABORWA MUNICIPALITY LIMPOPO PROVINCE.**

#### **Introduction**

This is an invitation to participate in the study as a volunteer. This is to help you decide if you would like to participate. Should there be any questions please feel free to ask the researcher.

#### **The purpose of the study**

The purpose of the study is to determine the provision of Personal Protective Equipment amongst contractors in a mine in Phalaborwa, Limpopo Province.

The sample of this study will be selected from both male and female contractors working in the mine (261).

Before the commencement of the study you will need to complete:

- This consent form and
- Short biographical information request

You are free to withdraw from the study without giving a reason. Participation is voluntary.

The aim of the study is to determine the provision of Personal Protective Equipment amongst contractors in a mine in Phalaborwa, Limpopo Province.

### **Has the study received ethical approval?**

This study will commence upon approval from Turfloop Research Ethics Committee, TREC and FOSKOR mine.

### **Rights of participants of the study**

Participation is voluntary. You have the right to refuse participation in the study. Refusal to participate will not in any way influence any future relationships with the school or the researcher.

### **Are there any risks**

There are no risks attached.

### **Discontinuation of participants in the study**

No pressure will be exerted on the participant to consent to participate in the study and the participant may withdraw at any stage without penalty.

### **Any financial arrangements**

There are no financial resources that participants can benefit from the study. The researcher is also not going to receive any incentives.

### **Confidentiality**

All information provided to the research team will be treated as confidential.

## **PART B:**

### **Informed consent form to be signed by the participants/caregiver**

I hereby confirm that I have been informed by the investigator, **Mhlongo Genesa** about the nature, conduct, benefits and risks of this study. I have also read the above information regarding this study.

I may withdraw my consent as well as my participation in the study. I also declare that I had sufficient opportunity to ask questions and therefore declare myself prepared to participate in the study.

**Participant/caregiver Name** \_\_\_\_\_

**Participant/caregiver' signature**\_\_\_\_\_

**Date** \_\_\_\_\_

**Investigator's name** \_\_\_\_\_

**Investigator's signature** \_\_\_\_\_

**Date** \_\_\_\_\_

I, Genesa Mhlongo, hereby confirm that the above participant has been informed fully about the nature of the study.

**Witness name** \_\_\_\_\_

**Witness signature** \_\_\_\_\_ **Date** \_\_\_\_\_

## Appendix 7: Time frame

	March	April	May	June	July	Aug	Sept	Oct	Nov
Departmental presentations									
SREC Submission									
FHDC submission									
TREC submission									
Request for Data collection and data collection									
Data Analysis									
Report writing									
Submission for examination									

## Appendix 8: Budget

Activity	Costs
1. Travel expenses (driving to Foskor and Stibium mine)	67 KM = R 350.00
2. Printing (informed consent, self-administered questionnaires).	<b>Informed consent</b> = R 3 x 254= R 762.00 R762.00 + R 762.00 (Include piloting one)= R1.524.00 <b>Questionnaires</b> = R 2 X 254= R 508.00 R508.00 + R508.00 (include piloting ones) = R 1,016.00
3. Purchase of PPE to be used on data collection day.	R 760.00
4. Editing	R1340.00
<b>Total</b>	<b>R4 640.00</b>

## Appendix 9: Editors letter



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19 April 2021

Dear Sir/Madam

**SUBJECT: EDITING OF DISSERTATION**

This is to certify that the masters' dissertation in Public Health entitled 'Provision and utilisation of Personal Protective Equipment amongst contractors in a mine in Phalaborwa, Ba-Phalaborwa Municipality, Limpopo Province' by Genesa Mhlongo (200908176) has been copy-edited, and that unless further tampered with, I am content with the quality of the dissertation in terms of its adherence to editorial principles of consistency, cohesion, clarity of thought and precision.

Kind regards



Prof. SJ Kubayi (DLitt et Phil - Unisa)  
Associate Professor  
SATI Membership No. 1002606

*Finding solutions for Africa*