International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 5, Issue 3, pp 441-448, March-2021

https://doi.org/10.47001/IRJIET/2021.503076

An Analysis of Factors Contributing to High Occupational Accident Prevalence Rate at Zimbabwe Electricity Transmission Distribution Company (ZETDC) Northern Region, Chinhoyi, Zimbabwe

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Abstract **- Workers are unaware of potential hazards present in their working environment which let them more vulnerable to injury. The study revealed that ZETDC management system is not effective in reducing unsafe practices by employees. 85% of the total population is not observed and monitored by management during overtime operations. Ninety one percent (91%) of the respondents indicated that they do their operations in harsh weather conditions The Chi – square test produced (p>0.0716) showing no significant difference of alcohol by accident involvement. Furthermore, the study revealed the causes of accidents as unsafe workplace practices like horseplay at work, inexperienced labour force, working while on cellphones, limited risk assessment before working, working under the influence of alcohol, improper use of machines, improper wear of personal protective equipment and safety and health ignorance. The study recommends that top management should be responsible for safety and health of employees through effective monitoring. Notably, supervisors need to observe and monitor employees whilst they do their operations. Furthermore, there is need to involve employees in safety and health trainings in areas such as hazard identification and control. Additionally, ZETDC should carry out periodic job task assessment and audits to identify areas for continual improvement in safety management.**

Keywords: Unsafe practices, Safety and health, Hazard identification, Risk Assessment.

I. INTRODUCTION

Occupational accidents and injuries are a global problem and there should be strategies to prevent these events (LaDou, 2003). More than 337 accidents happen on the job each year as well as occupational diseases resulting in more than 2.3 million deaths and an average 5% of the workforce is absent from work every day due to sickness or injury (Fuchs et al., 2012). According to Ahmed (2003), global industry trends highlights an increase in outsourcing of non-core business activities such as construction, maintenance and engineering, to mention a few. The trends indicate that contractor face 1.5 to 3 times higher incident rates than employees of the outsourcing company(Larsson, 2000).

According to Harms-Ringdahl (2013), Sub-Saharan Africa, ILO recorded more than 257 000 total work-related fatalities, including about 55 000 injuries in 2013 showing that accidents at work are a significant problem at regional level. The South African mining industry recorded 220 non-fatal, 171 fatal accidents and 3763 injuries in 2013 (Karikeka, 2014). Zimbabwe is also experiencing similar problems of accidents at work (Rukwava, 2016). The number of people injured and killed in work related incidences from 2014, marginally increased according to the official statistical data of 2014 from National Social Security Authority (NSSA). According to the statistics, 3 598 people were injured while 71 died between January and September 2014 to work related accidents.

Zimbabwe Electricity Transmission Distribution Company (ZETDC) Northern Region, Chinhoyi is responsible for maintenance and electrification in Chinhoyi and a limited area surrounding Chinhoyi. The organization is facing a challenge of falling to reduce the rate on which their accidents are occurring on monthly basis. According to the ZESA Holdings Annual Report, 2013, Northern Region, Chinhoyi had the highest accidents record amongst all other regions in Zimbabwe.

Studies on occupational accident prevalence have been carried out to determine injuries prevalence (Coleman and Kerkering, 2007). The aspect of workplace accidents has been covered in several studies especially with reference contract workers and attitudes to safety at work (Karikeka, 2014, Saari, 2001, Aronsson, 1999). However, to the best of our knowledge, the occurrence of occupational accident in power distribution companies is still not well documented in literature. Studies on occupational accident prevalence in electrical power distribution companies that can be traced are those linked to construction

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related accidents (Poon et al., 2000). Furthermore, a few studies have investigated the causes of occupational accidents in workplaces such as power distribution companies (Cox and Reid, 2000, Saha and HG, 2013, Harms-Ringdahl, 2013). ZETDC Northern Region has a target threshold of zero accidents per month. However, since 2013 ZETDC has been recording at least three accidents per month which is far above its targeted threshold. Thus, in this study we investigate the factors contributing to high accident prevalence rate at ZETDC Northern Region, Chinhoyi in order to suggest sound strategies towards lowering this excessive accident prevalence.

Study Area

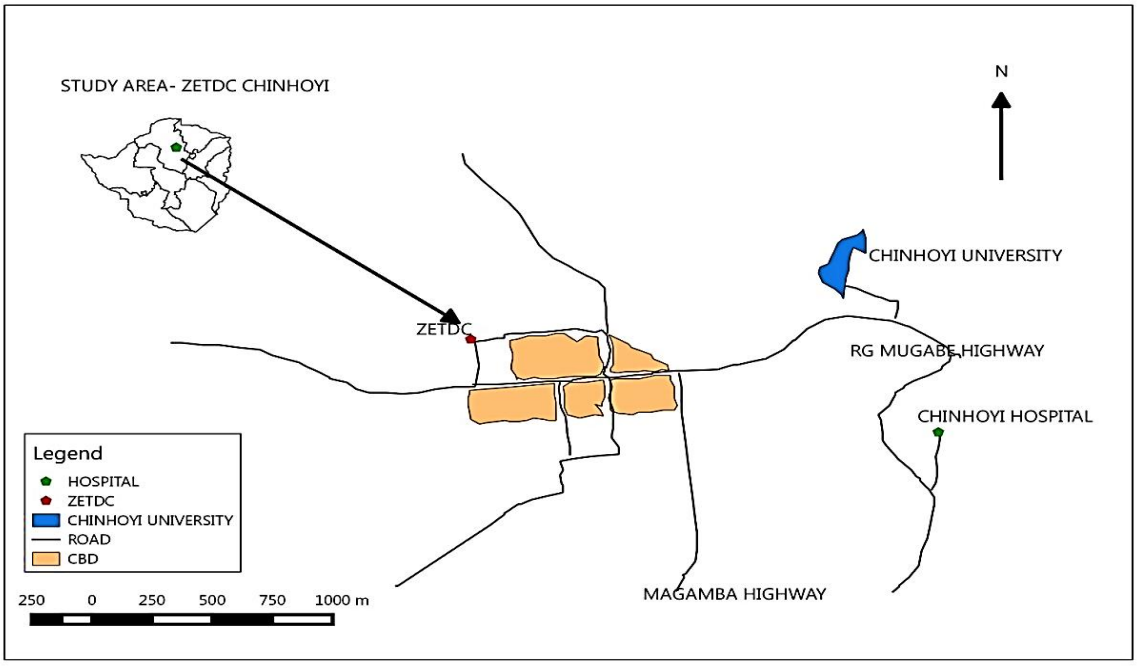

Figure 1: ZETDC Northern Region

Chinhoyi is a city in the northern central part of Zimbabwe. It is the administrative center of the province of Mashonaland and the center of the Makonde district. The city is located approximately 125km to north-west of the capital-Harare; on the banks of the Manyame River. Chinhoyi is located at latitude -17.36667and longitude 30.200000, with an estimated population of 61 739 people. Since in the 80's Chinhoyi town had already begun developing. Electrification in residential areas and surrounding farms was already taking place due to population growth demand. The area is surrounded by farms and is known for its agricultural activities that demand electricity.

ZETDC Northern Region is located at the edge of Chinhoyi's Central Business District (CBD). The organization is responsible for Chinhoyi's electrical development, maintenance and distribution. ZETDC is in charge of all electrical faults, electrification, electrical repairs and to ensure electrical safety to the members of the public. The organization majors on the engineering of electrical distribution, therefore it regards safety as one of its core values.

II. METHODOLOGY

Research design

A descriptive cross-sectional study was employed in this enquiry. The study was limited to ZETDC Northern Region, Chinhoyi. The sampling frame consisted a total of 68 workers. A sampling size was derived from the sampling frame. The sample size of this research consisted of 52 respondents.

Sampling procedure

The study employed systematic sampling. This is because this technique has the power to offer an equal chance of selection into the study hence implying more scientific integrity for the study. The researcher compiled a contractors' list from the

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human resources department. Subjects in the population were sampled by a simple random process. Human resources mangers and engineers were selected using purposive sampling.

Data collection instruments

The study used self-administered questionnaires to gather qualitative data on factors contributing to accident prevalence on employees. The questionnaire was structured to gather demographic data, unsafe acts and working conditions contributing to accident re occurrence. The questionnaire was designed in a way that the questions were clear and unambiguous, short, avoided unnecessary jargon and specialist language. It was structured in such a way that it was easy and quick to answer. Triangulation was done through using a structured observation checklist guide.

Limitations of the questionnaire

The questionnaire had limitations as it lacked validity if used alone because the researcher has no control over who fills the questionnaire. Respondents can ask others to fill the questionnaire for them in their stead, therefore resulting in gathering of biased data. Moreover, they do not penetrate deeper enough to show realistic views and instructions.

Challenges encountered administering questionnaires.

Employees delayed answering the questionnaires. However, this was addressed by the management as it enhanced follow up to respondents to answer questionnaires.

Observation

The researcher used direct observations by visiting working sites, noting down some observations, gathering firsthand information, not interacting with the field workers but rather observing their working procedures.

Checklist guide survey

The researcher designed a checklist for assessing whether the strategies, methods of operations currently employed by company's top management are effectively and strategically improving the safety of workers. The researcher used a checklist to assess top management commitment to safety of their employees through: awareness of top management of unsafe acts by employees during operations, awareness of top management on working condition of their employees, presence of written and displayed safety and health policy, policy review and revision procedures, availability of training records and manuals, provision of appropriate safety equipment, maintaining of personal protective equipment on work sites and emphasis of safety over productivity.

Data analysis

Bar graphs and tables were used to present data. Bar charts provide a more accurate presentation and the heights of bars represent the frequency of occurrence. The bar graphs were used to present data and assist to compare differences between variables and the trends. The Statistical Package for Social Sciences V.16.0 was used to process the descriptive qualitative data. The researcher also used Pearson Chi Square to determine the relationship between variables.

III. RESULTS

Response rate

Fifty-two questionnaires were distributed and forty-six (n=46) were returned. Six questionnaires were not returned resulting in 88% response rate.

Demographic data

In the group, 70% of the population/ workforce (n=46) are 30 years and below. Most of respondents are encompassed in the 21-30 years covering 61% of the sample. The 31-40 years age group constituted 24% of the sample. This gives an implication that the majority of ZETDC, Chinhoyi consists of an active population of young people, possibly due to the physically demanding

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nature of the occupation of electrical lines construction and maintenance. Fifteen percent (15%) of the respondents' age range from 41years and above

Unsafe work practices

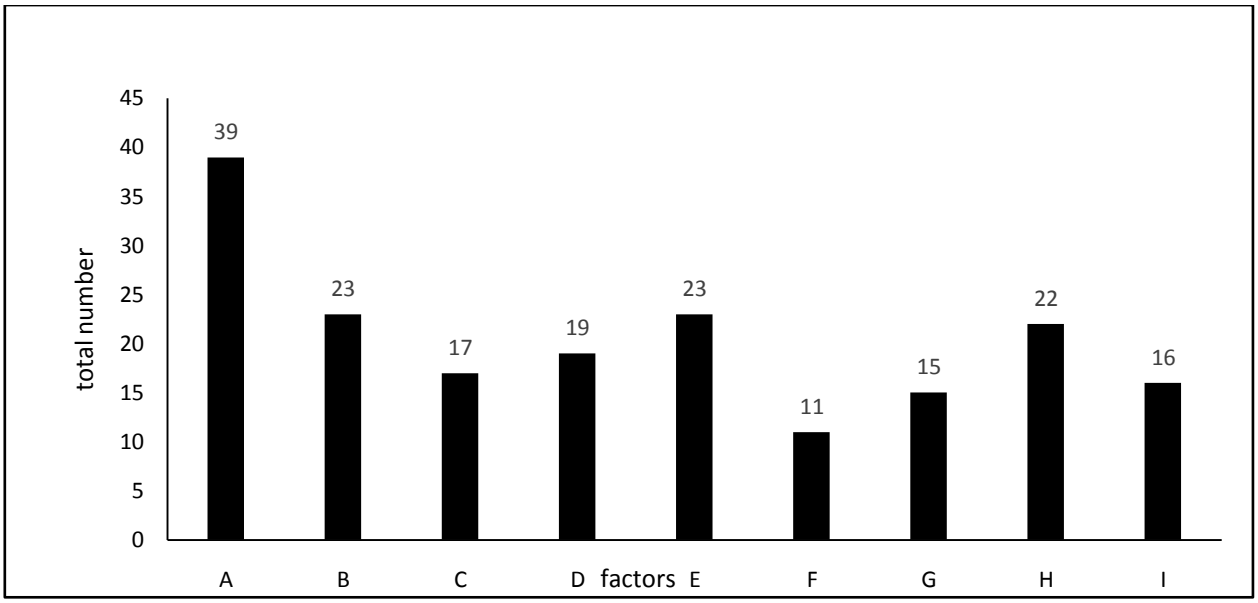

Figure 2: Unsafe work practices, Source: primary data

Key:

A-working over time without supervision; **B**- safety and health interests' ignorance at work; **C**- improper wear of PPE; **D**- improper use of machines and tools; **E**- working under the influence of alcohol or drugs; **F**- working talking on cell phone G- risk assessment before working; H- inexperienced labour force; **I**- horseplay at work

Figure 2 above shows that most of the employees carry out overtime operations without supervision. Out of 46 responses 39 stated that they are not observed and monitored carrying out their tasks. 85% of the total population is not monitored by management during overtime operations. Respondents stratification on working under the influence of alcohol or drugs, shows that fifty percent (50%) of the respondents agreed that they work under the influence of alcohol or drugs. The Chi –square test produced ($p>0.0716$) showing no significant difference of alcohol by accident involvement.

Working conditions

Forty-one (n=41) respondents highlighted that they work under harsh conditions. Few workers are satisfied with their working sites (n=4); 9%. More so, the workers do not know behaviour based safety (n=9) which means the trainings done by the organization are not effective. Twenty-three (n=23) respondents stated that they were at least involved in an accident which represents half of the sample.

Working under harsh weather conditions

Ninety one percent (91%) of the respondents indicated that they conduct their operations in harsh weather conditions. Forty-one (n=41) respondents indicated that they do their operations in unsafe or unhealthful working conditions which exists at any worksite where they are allocated for a particular operation. Chi –square test produced ($p>0.131$) showing no significant difference of employee's education by accident involvement. Working under harsh weather conditions is not significant towards accident causation.

Behavior based safety

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The results were drawn from a sample size of questionnaire responses (n=46) from contractors. Twenty percent (20%) indicated that they are familiar with behaviour based safety and its benefits in accident reduction. Eighty (80%) do not know. The Chi –square test produced (p>0.019) showing significant difference of level of education and behavior-based safety.

Emergency procedures testing and evaluation regularity (n=46)

The responses showed that the organization is not testing its emergency procedures on a regular basis as shown by 26.7% (n=12) respondents whilst 73.3% (n=34) of the respondents indicated that the emergency procedures were tested and evaluated on a regular basis. Across all the occupations there is no significant difference in regard to emergency procedures testing and evaluation as an accident prevention method. Level of education varies significantly with emergency procedures (Chi Square=11.786, df=4, p<0.019). Accident prevention significantly varies with the regular testing and evaluation of emergency procedures.

Table 1: The relationship between emergency procedures and level of education

Specific task	X^2	P- Value	Value	Significance
Level of education	11.786	0.019	Pearson Chi Square	Significant
Accident prevention by emergency procedures	9.127	0.010	Pearson Chi Square	Significant

Road behavior observations as a contributing factor to accidents.

It was found that non-use of safety belts, failure to stop on stop signs and speeding are major behaviors of concern.

Top management's commitment

Observations done justify that management is to some extent committed towards health and safety of workers. The results show that the organization indulges workers in safety and health trainings and there are records of the training programmes and dates.

IV. DISCUSSION

Unsafe work practices

The study used a combination of primary and secondary data to explore the complex interactions of factors that compromise safety at working sites. The findings collated under the objective to asses unsafe work practices show that, the prevalence of accidents is because the organization is not reviewing and evaluating its safety management systems on an ongoing basis to prevent accident occurrences. A total of more than 3 accidents, above the expected threshold of 0 were recorded between 2012 and November 2014 (Rukwava, 2016). These accidents were a result of unsafe working practices, which are working overtime without supervision. This factor accounted for (n=39) which means 85% of the total population of the employees are not monitored by management when doing there their daily operations. Alcohol tests are to be done frequently, however from the data collected from the questionnaires, (n=23) indicated that they work under the influence of alcohol. Alcohol and drugs have effects that impairment vision and judgment, also makes one to be aggressive, argumentative or become weak. This justifies that a person under the influence of alcohol is prone to accidents.

Working conditions

The study indicates that there is a varied significant between accident and age (Chi Square=8.440, p<0.040) Respondents have information regarding safety issues and they are struggling to communicate to their safety officials, who will help to identify corrective actions and address them amicably. Accident involvement varies insignificantly with level of education (Pearson Chi Square=2.108, p>0.716). Eleven percent (11%) of the total respondents does not know about behavior-based safety, meaning that the organization is not offering safety training to its employees. According to Fern and Alzamora (1999) behaviour based safety is about promoting safe behaviours at work because behaviour turns systems and procedures into reality. Behavior based safety

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was significantly linked to level of education of employees (Wald Chi Square =11.786, p<0.019). The study shows that unsafe working conditions results in accidents prevalence, however, defective equipment, failure to maintain safeguard tools and equipment, poor housekeeping, hazardous environmental conditions contribute to accident prevalence. At ZETDC, accident prevalence rose between 2011 and 2013 due to insufficient knowledge in workers related to their tasks, failure to identify unsafe conditions thus there was no consideration of any risks, recognition of potential hazards.

Accident prevention techniques

The research revealed that the organization has accident prevention techniques in place. The organization has safety improvement strategies that address the safety, security, health and welfare of employees before, during and after the accident, and these tangible deliverables makes an accident crisis less severe. However, these methods are less effective and are sometimes not implemented adequately in mitigating hazards.

Peer to peer education

Peer to peer observations are not done amongst management and workers. Peer to peer education is a management tool which ZETDC must effectively implement. It is a leading indicator which helps to point out issues that can cause accidents and management must address issues raised to control or prevent accidents. Fuchs et al. (2012) states that reliable tools for measuring OSH (Occupational Safety and Health) performance are positive performance indicators such as daily safety talks. The research showed that ZETDC fails to effectively implement peer to peer observations, out of 46 responses 39 stated that they are not observed and monitored carrying out their tasks.

Work observations (WOs)

It is a continuous accident / incident prevention method which involves the observation of the worker by the immediate foreman or supervisor whilst performing daily routine. The primary objective of the WOs is to assess whether or not the employee is conforming to the set safe operating procedural way of doing such a task. However, the study shows that field workers carry their operations without observation most of the time. The system of ongoing observations and feedback is vital as it initiates information collection and problem solving to improve the identified behaviours to reduce accident prevalence. This information will help to identify corrective actions and address them amicably (Karikeka, 2014).

Safe working procedures (SWPS)

This is a detailed step by step work executing strategy which addresses the hazards that would have been identified in the risk assessment. ZETDC has SWPS formulated by the engineers who have the knowledge and skills on the safe execution of a particular job operation. Safe work procedures inhibit employees from taking chances, shortcuts and promotes a culture of safe work systems (Larsson, 2000). SWPS enhance proper job safety behavior.

Management perspectives

The results show that ZETDC management is partially committed towards safety issues as it considers safety issues in the organization's budget although a few issues are addressed. Management commitment is limited shown by lack of frequent provision to safety education, employee safety performance assessment, regular testing and evaluation of emergency procedures. Management only advocates for safety compliance rather safety participation hence no employee involvement in decision making ergonomics analysis, accident investigations and this also resulted in the rejection of the feedback that is safety data performance.

Employee perspectives

The study found that employees are not satisfied with their working conditions. Responsible supervisors are not fully concerned about the safety well-being of field workers. Respondents indicated that they work in adverse conditions only to meet job targets with the least expenditures. Supervisor's priorities are productivity rather than the safety of the employees. 89.1 % (n=41) of the employees have indicated that they work in harsh conditions, and (n=37) employees are not formalized with behavior-based safety. More so, 8.9% (n=4) are the only employees satisfied with their working sites. The study found that employees do not report near misses and incidents for the past four years basing from the secondary data. Heinrich's accident pyramid illustrates that for a serious injury to occur there should be 300 near misses.

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Safety culture and establishment of OHS

Top management records from secondary data showed that employees were not trained on OSH on their jobs regularly. This shows non-compliance of OHSAS 18001:2007 clause 4.4.2 on competence, training and awareness which states that employees must trained and certified for competence on their tasks. This is also supported by Statutory Instrument 68 of 1990 which requires employers to ensure that OSH training programmes are established and employees attend these OSH training programs. Building and maintaining an effective safety and health culture requires making use of all available means of increasing general awareness, knowledge and understanding of the concepts of hazards and risks and how they may be prevented and controlled (Zhou, 2016).

Monitoring and evaluation

The organization is not monitoring and evaluating its safety management systems on an ongoing basis that are implemented to prevent accident occurrences. Therefore, this is contributing to an increase to accident prevalence. Failure to observe and monitor 85% of the total population of the employees shown by the results by management when doing there their daily operations is a resulting factor to re-occurrence of accidents.

V. CONCLUSION AND RECOMMENDATIONS

Safety interventions that are being employed at ZETDC are failing to mitigate the problem of high occupational accident prevalence. Failing of the interventions is a result of multiple factors that range from the employees' attitude towards their working conditions to the management styles being used to monitor the employees. Lack of proper scientific managerial skills and proper supervision contributes to failure of safety management. Therefore, it is vital for management to concentrate more effort on employees' supervision, promotional activities, OSH management systems, worksite risk assessment, training and awareness, peer to peer observations and behavior-based safety. We recommend the implementation of new preventive and safety methods to reduce the high accident prevalence at ZETDC, Chinhoyi.

REFERENCES

[1] AHMED, I. 2003. Decent work and human development. *Int'l Lab. Rev.*, 142**,** 263.

[2] ARONSSON, G. 1999. Contingent workers and health and safety. *Work, employment and society*, 13**,** 439-459.

[3] COLEMAN, P. J. & KERKERING, J. C. 2007. Measuring mining safety with injury statistics: Lost workdays as indicators of risk. *Journal of safety research*, 38**,** 523-533.

[4] COX, D. R. & REID, N. 2000. *The theory of the design of experiments*, CRC Press.

[5] FERN, B. & ALZAMORA, L. P. 1999. HOW-AND WHY-BEHAVIORAL SAFETY NEEDS TO CHANGE. *Occupational health & safety*, 68.

[6] FUCHS, S., BIRKMANN, J. & GLADE, T. 2012. Vulnerability assessment in natural hazard and risk analysis: current approaches and future challenges. *Natural Hazards*, 64**,** 1969-1975.

[7] HARMS-RINGDAHL, L. 2013. *Guide to safety analysis for accident prevention*, IRS Riskhantering Stockholm.

[8] KARIKEKA, L. 2014. Critical evaluation of the contractors's occupational safety and health (OSH) management system in the prevention of occupational accidents at Zimplats, Selous.

[9] LADOU, J. 2003. International occupational health. *International journal of hygiene and environmental health*, 206**,** 303-313.

[10] LARSSON, T. 2000. The diffusion of employer responsibility. *Systematic Occupational Health and Safety Management—Perspectives on an International Development. Elsevier Science Ltd., Oxford*.

[11] POON, W., MA, C. & HO, K. Statistical analysis on factors in reducing construction site accident frequency rate in Hong Kong. Proceedings of the 6th Annual Conference of the Australian and New Zealand Association of Occupational Health and Safety Educators, Hong Kong, 2000. 341-355.

[12] RUKWAVA, W. 2016. *Assessment of the risk factors and implications of electrical accidents. A case of the Electricity, Transmission And Distribution Company, Mutare, Zimbabwe.* BUSE.

[13] SAARI, J. 2001. Accident prevention today. *Magazine of the European Agency for Safety and Health at Work*, 4**,** 3-5.

[14] SAHA, A. & HG, S. 2013. Occupational injury proneness in young workers: a survey in stone quarries. *Journal of occupational health***,** 12-0150-OA.

[15] ZHOU, S. 2016. *An investigation into the causes of occupational accidents at Arcturus Mine, Harare.* BUSE.

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Citation of this Article:

Ivainashe Musabayana, Tafadzwa Mandizvidza, Dr. Chipo Mutongi, Dr. Smartson. P. Nyoni, Thabani Nyoni, "An Analysis of Factors Contributing to High Occupational Accident Prevalence Rate at Zimbabwe Electricity Transmission Distribution Company (ZETDC) Northern Region, Chinhoyi, Zimbabwe" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 3, pp 441-448, March 2021. Article DOI https://doi.org/10.47001/IRJIET/2021.503076

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