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Earthmoving Equipment Cabin Conditions And Its Health Impact On Operators

By

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DECLARATION

I hereby declare that this submission is my own work towards the Msc. Construction Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of my other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

The building and civil engineering construction industry is one of the fastest growing industries in the world. Construction and civil works are widely regarded as an accident prone work. Earthmoving equipment operators are seven times likely to be involved in an accident that an operator in any sector except mining. Ghana Labour Act, 2003, Act 651, ensures that employees are not exposed to conditions that would lead to work related injuries or illnesses. Factories, offices and shops Act 1970, Act 328 and the Mining Regulations 1970
LI 665 all relate to the health safety of employees on site. Workmen‟s Compensation Law 1987 (PNDC) which relates to compensation for personal injuries caused by accidents at work and hence, indirectly impacts on monitoring worker/workplace safety. It is expedient for construction owners to ensure health and safety at their worksite without putting the life of their earthmoving equipment operators at risk. The objectives of this research are to determine the standard conditions of earthmoving equipment cabin, the current state of earthmoving equipment cabins on construction sites, the impact on the health and safety of operators and to make recommendations to rectify the poor conditions. Research methodology included ample literature review and questionnaire survey. The questionnaire was designed based on the literature review and distributed to the targeted respondents in the Western and Central region. Responses were analyzed. From the feasibility study conducted, responses were analyzed using both quantitative and qualitative method. The sole aim of this work is to assess the earthmoving equipment cabin conditions and its health impact on operators. Data for the study were collected through a questionnaire survey administered to earthmoving operators in Takoradi and Cape Coast building and civil engineering construction industry. Data collected were analyzed and ranked using Relative Importance Index (RII) and Descriptive statistics methods. As a conclusion, the research also reveals major effect of earthmoving equipment poor cabin conditions and its health impact on operators. As recommendations, employers of equipment operators should ensure that, they fix the earthmoving equipment with well-structured Roll-Over Protective structure (ROPS) or Falling-Object Protective Structure (FOPS).

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DEDICATION

To my late Mother Maame ArabaWangara, my lovely son Ernest Takyi Cudjoe and to Almighty God who through his love, protection and mercies has seen me through this years of studies.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 BACKGROUND OF STUDY

Construction is an important industry in terms of the annual capital invested in construction work and its high employment. The importance of the industry can also be measured by its contribution to the gross national product. However, the construction industry is in a difficult position due to the decline in construction productivity which started in the mid 1970"s. The current stringent financial situation aggravates these difficulties.

Facing these challenges problems, the construction industry became aware of the importance of productivity improvement and cost reduction, and is striving for such improvements. Historically, productivity improvement was often focused on labour effort: this also applied to the construction industry. But there is a second important term in production improvement especially in construction industry which is the earthmoving equipment.

Before commencing any earthmoving work, the first thing is to take a critical look at the various types of earthmoving equipment that exist, bulldozers, angle dozers scrapers tractor, shovel, graders, crawler and wheel mounted dozers ect. When using earthmoving equipment, the safety of the operator must be assured whiles the state of the operator"s cabin where he/she sits to operate must be favourable.

In many of the building and civil engineering construction sites in Ghana, the state of the earthmoving equipment used by the operators is not livable.

In executing large work of building and civil engineering construction, the problem of moving a huge quantity of excavated or spoil materials over long distance at high speed remains the key to low cost and early completion of most projects. Earthmoving is becoming an

increasingly imperative aspect of our lives today, and the efforts of thousands of people. When dealing with earthmoving equipment, the safety of the operator must be assured, whereas the condition of the cab where the operator sits to operate must be favorable. In most construction sites in Ghana, the condition of cabin in relation to earthmoving equipment is appalling. The high rate of onsite accidents may be attributed to the poor conditions of the cabin where the operator sits.

Many equipment operators look at cabs from the inside-out. They enjoy the air conditioning and XM radio in a nice comfy seat with great amenities, the cab is more importantly the protective shell between the operator and the environment outside.

1.2 PROBLEM STATEMENT

Employers have the most duties to perform to ensure the health and safety of operators. Practicable steps must be taken to ensure safety at the worksite by providing and maintaining a safe working environment. Ensuring that machinery and equipment are safe for the operators, the working arrangements are not hazardous to operators and also emergencies that may arise while operators are onsite (Chetwin, 1999).

Operators of heavy mobile mechanical plant such as bulldozers, loaders, graders, tractors and scrapers, are at risk of serious injury or death by crushing if their machines roll over or tip onto their sides. Generally, the risk depends on the terrain. There is a low risk on flat, stable ground and a high risk on steep or unstable ground, or on work adjacent to embankment, excavations or ditches. Fitting an operator protective structure, together with wearing a seat belt, can reduce the risk of serious injury or death in the event of a roll-over or tip-over. When there is a risk of objects falling onto machine operators or entering the driving position, debris or demolition

material on construction sites, the operator needs the security of a protective structure (OSH 3681 HEO).

This research basically seeks to address the issue of earthmoving equipment cabin conditions and their impact on construction site accidents due to the general nature of unhealthy earthmoving equipment being used on most construction sites of Ghana.

1.3 AIM AND OBJECTIVES

The aim of this research is to explore the impact of earthmoving equipment cabin conditions on the health and safety of the operators.

1.4 JUSTIFICATION FOR THE STUDY

The specific objectives of this study are:

1. To determine the standard conditions for earthmoving equipment cabins.
2. To assess the state of earthmoving equipment cabins.
3. To establish the impact of poor cabin conditions on health and safety of operators.
4. To make recommendations on improving cabin conduction of earthmoving equipment on operators.

1.5 SCOPE OF THE STUDY

The geographical scope of this study is in western and central region. The reason for choosing western and central is that there were many building and civil engineering construction activities going on there using earthmoving equipment. The contextual scope includes earthmoving equipment, operators and engineers in the various building and civil engineering construction companies which make use of the said equipment.

1.6 METHODOLOGY

This research seeks to enlighten the reader on both standards of existing cabin conditions and how they relate to health and safety of the operators. This study will assist earthmoving equipment managers understand the primary requirement making for provision for a safe way and sound condition for the operator‟s cabins. More so, equipment operators will be aware of the risk or any potential source of danger associated with poor cabin conditions. This study will help building and civil engineering construction managers decrease on unnecessary cost which may arise as a result of negligence or mistake. Furthermore, the research is going to assist in decreasing injuries which operators are exposed to which will in turn, ensure quality health safety in the building and civil engineering construction industry. Finally this research will benefit academia since people will now get to understand earthmoving equipment cabin conditions and its health impact on operators

1.7 SIGNIFICANT OF THE STUDY

The researcher obtained information for the study from the following sources,

1. Primary Sources – Questionnaires and observations
2. Secondary Sources - Textbooks and lecture notes, Industry Literature, Internet, journals.
3. Questionnaires were formulated and distributed in order to gain the views and knowledge of the effects of poor cabin conditions from operators in building and civil engineering construction activities.

The researcher had one on one interaction with the respondent to know their views about the topic at hand, photographs will also be taken. The findings from the respondents were put together to develop a questionnaire where the earth moving equipment operators were allowed to answer. Data was be analyzed largely through descriptive statistics thus, standard deviation and percentage, and the result was presented in tables and charts.

1.8 ORGANISATION OF STUDY

This research is organized into five basic chapters. Chapter one basically talks about the introduction, which comprises the background of the study, problem of the study, aims, objectives, scope of the study, significance of the study, brief methodology, scope of the study and the summary. Chapter two examines the literature review. Chapter three discuss the methodology, chapter four focuses on findings, result and discussion collected on the study. Chapter five, the final chapter deals with the summary, conclusion and recommendation of the research outline the flow of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Earthmoving equipment can be said to be a mobile or power-propelled vehicle designed to carry, dig, spread, or move earth or material from one place to another. Examples of earthmoving equipment are graders, dozers, scrapers, etc.

The provision cannot be underrated. The plant operator and the workplaces are protected by law, or the employer has a duty of care to protect the operator himself /herself. The project manager, construction manager, supervisors and all those concerned with construction activities are to ensure that construction work is carried out by competent personnel; workers on site should be quickly reported;

Research seeks to address the bad conditions of earthmoving equipment on the Ghanaian construction site as compared to standard relating to operators and accidents on site. It also pursues to make recommendations on safe practices to be employed on site to help reduce the increasing rate of accidents caused by the poor state of most earthmoving equipment cabin.

2.2 TYPES AND USES OF EARTHMOVING EQUIPMENT

The primary function of earthmoving equipment are many and include; facilitation of both on-site and off-side construction activities more easily such as moving soil and debris and rock from part of a construction site to another to undertake activities which cannot be carried out by the traditional manual method (manpower).

The various kinds of earthmoving equipment are;

- Bulldozer
- Angle dozer

- Scraper
- Tractor shovel
- Graeder
- Face shovel
- Skimmer
- Trencher
- Backacter

2.2.1 SCRAPERS

A scraper is allowed for loading, hauling, dumping and spreading of loosed materials. There are varieties of scraper types and sizes, some may be towed behind crawler tractors. It can be seen that, the hazards and precautionary measures which applies to one equipment is common to the others. The motorized scrapers are generally high speed movers of earth. When it comes to the servicing and repairing of scrapers, it could be quite hazardous except proper precautionary measures are taken (CITB, North Ireland 1998). Occupational Health and Safety Branch, 1998, Guidance notes on safe use of earthmoving machinery, 1st edition, North Ireland.

Scraper is suitable for large surface area excavation where the spoil is to be deposited on site for future or other uses. It can be used for bulk excavation over smaller uniform areas. In such cases, the scrapper is substance used for cut and fill work. It can be used for site leveling where the excavated materials are to be deposited in spoils on site.

2.2.1.1 USES

They off strip the top-soil from one part of the site and stockpile it on another part of the site. They can also be used for excavation works which includes roads, ovals and dams among others. When landfill works are to be done, scrapers are used to excavate the earth and curt it over unmade roads and paddocks (Field Manual, 2000).

2.2.2 BULLDOZERS

Bulldozers are perhaps the most basic and versatile equipment in the construction industry. Dozers are designed to provide high drawbar pull and traction effort. They are the standard equipment for land clearing, dozing and assisting in scraper loading (Field Manual, 2000).

With crawler-mounted dozers, it excels in earthmoving especially when fitted with a blade. The bulldozers are used for stripping top soil and for moving loose material debris. It is highly recommended for operations which involve extensive cutting and filling a given stretch of land or road.

In such instances, drawing up a mass haul diagram to indicate the levels and determine the volume of cut and fill will assist in planning the work. The bulldozer is therefore useful in backfilling, spreading and stock pulling materials on site for future use.

2.2.2.1USES

They are designed specifically for land clearing, dozing and assisting in scraper loading. It is also used to push large quantities of soil, sand, rubble, or other such materials during construction. The crawler bulldozer looks like a tractor and it is used for pushing sand and other materials from one part of the site to another. Since it is a tracked vehicle, it does not have tires therefore it requires another equipment to transport it to and from site. It can crush any hard surface so it is most suitable for use in irregular fields. The wheel dozer on the other hand has large and heavy tires which allows it to function well. The difference between the wheel and the crawler dozer is the fact that the wheel one can move on a small axis unlike the crawler dozer which is not able to do that. The wheeled dozer has a fully articulated hydraulic steering that is quite easy and flexible to operate (MachineryZone.com).

2.2.3 GRADERS

A grader is similar to the bulldozer but it has its cutting blade at the center of the classis of the equipment. It consists basically of an adjustable blade suspended between the wheels of a wheeled framed power unit. The blade can be pivoted both in the horizontal and vertical planes. A grader is primarily required for final leveling although it may sometimes be used for topped stripping or cutting which the equipment is capable of undertaking. It is also for maintenance of such as haul roads, leader roads, etc. The inclination of the blade allows it to be used for trimming of banks and cutting of runoffs and ditches.

2.2.3.1 USES

The grader‟s purpose is to „finish grade‟ after heavy equipment like dozers and scrapers have performed the „rough grading‟. They are commonly used in the construction of dirt roads and gravel roads. Also, they are used to set native soil foundation pads to finish grade prior to the construction of large buildings (Orlemann, 2007).

2.2.4 TRACTOR SHOVEL

A tractor shovel is construction equipment consisting of a heavy chassis and tracked undercarriage with bucket mounted on loader for years.

Tractor shovel is also used for cutting and loading of earth. Using the same equipment the bucket can conveniently excavate to a depth of about 300mm. At any given time eight (8) charge spoils up to a height of 4.901m.

A tractor shovel can however tip spoil at its rear but in such situations, the extent of maneuvering is reduced. The wheeled and lighter version of tractor shovel is able to load excavated materials at a faster rate. It can be used for soil stripping or over site excavation as well as excavations against a face. It is also suitable for pushing cut material to a spoil heap.

Loading of spoil or loose materials can also be undertaken with the tractor shovel and its equivalent versions/types.

2.2.4.1 USES

A tractor shovel can be used for cutting and loading earth using the same equipment. It can excavate up to a depth of 300mm. Its lighter version can tip soil at a faster rate. It can be used for soil stripping and oversight excavation as well as excavation against a face. It is suitable for pushing cut material to a spoil heap. A tractor shovel may be fitted with a 4 in 1 bucket so that it can carry out bulldozing, excavating, lifting and loading activities. Loading of loose materials can also be made possible with the use of tractor shovel or its equivalent versions.

2.2.5 FACE SHOVEL

Face shovel is used for excavating against a face or a bank. It is suitable for clay and other similar materials. It can be used to handle rock and stone that has been clown into smaller and loose units by other means and methods.

2.2.6ANGLE-DOZER

Angle dozer can be described as a variation of the bulldozer. Like the bulldozer, the angledozer is a power-operated machine with a blade which is adjusted in height for pushing, side custody and spreading excavated material as for open cast pit, cleaning land or leveling runaways.

2.2.7 SKIMMER

Skimmer is suitable for over site excavation where leveling and transporting of the soil is to be undertaken together. Loading of loose materials such as sand, rock and spoil heaps can be carried out with a skimmer. It is highly accurate and it can therefore be used to excavate in areas where services are located and care must be taken in excavating.

2.2.8 BACKACTER

Backacter is used for deep excavation and trenches. It can deposit preserved spoil heaped materials from, for example a trench, to distant spools. It is suitable for excavating areas to an appreciable depth. A backacter can load the material it excavated as heap spoils for future use. It can turn 360^{O} and this allows the backacter to load waiting dumps truck at a faster rate.

2.3 STANDARD CONDITIONS FOR EARTHMOVING EQUIPMENT CABINS

It was identified that, most of the earthmoving equipment used by the operators in our Ghanaian construction industry today default. A good carbin supposed to be well equipped. Some requirement which are necessary for a good carbin are as follow; seat belt, seat absorber, seat adjuster, dashboard, air condition, steering, wheel, break, carbin light, floor, roof, widow and fire extinguisher and operator‟s manual.

2.4 CURRENT CONDITIONS OF EARTHMOVING EQUIPMENT CABINS

Earthmoving machines, especially those used in quarrying, usually move over difficult, frequently steep and often more dangerous terrain. In order to avoid collision or overturning, the cabin must provide a clear view of the area of operation. He cannot do this from the driver‟s seat only. Considerable freedom of movement in the cabin is required so that he cannot only lean forward and wriggle about whilst sitting on his seat but can also stand up from the seat while the machine is travelling and, for example, lean sideways out of the cabin so that he can be able to steer the machine while he is standing up.

The freedom of movement required in the cabin has prevented effective protection of operators in the event of collision or overturning of the machine. Although cabins could be sufficiently reinforced by means of roll bars or the like to prevent crushing in the event of overturning, there has, up till now, been a lack of suitable harnesses which ensure that the operator is held fast in such event, particularly to prevent ejection from the cabin, by which restrict as little as

possible the freedom of movement of an operator in a cabin (Czernakowski, 1978). We realize from the abstract above that, most of the equipment used on our construction sites have very severe cabin conditions. The conditions present in the cabin, such as, lack of air conditioners, lack of seat belts and seat absorbers, coupled with other issues do not allow the operator to feel comfortable when operating with the equipment. The state of earthmoving equipment in most construction sites today is appalling. This leads to the increased number of accidents which occur on the Ghanaian construction sites.

2.5 THE IMPLICATIONS OF POOR CABIN CONDITIONS

It is necessary to select appropriate equipment for a particular type of earthmoving work. Several factors should be taken into consideration when selecting equipment for usage.

To ensure the safety of the operator (OSHB, 1998). On most construction sites today, it is likely to notice the poor cabin conditions of most earthmoving equipment. You can look out for loose, missing or damaged bolts, missing doors and windows, damaged cabin lights, missing seat belts among others. This can go a long way in affecting the health and safety of operators since they are exposed to the harsh environment on the construction site. Most accidents on construction sites are related to the poor conditions of cabins. The factors which are believed to have led to the death of the operator was lack of maintenance of the equipment and also the poor condition of the seat belt and the brake.

2.6 STRATEGIES TO CURB AND IMPROVE THE CONDITIONS OF POOR CABINS

The cabin conditions should be regular inspections carried out on the equipment. It may well be daily, weekly or monthly. Primarily, there should be an exhaustive examination of the cabin which any defect notices should be reported immediately. Modifications cannot be made

without the direct permission from the manufacturer. Likewise, only qualified personnel should be allowed to work on the equipment to prevent future glitches.

The strategies to improve these conditions must be that, whenever a failure is detected, it should be reported to the top management who in turn must take an immediate action to correct the defect. Also, planned preventive maintenance must be adopted as compared to the emergency maintenance which is mostly practiced on our sites in Ghana. In so doing, the rate of accidents will be cut down and the health and safety of operators will be improved leading to an increase in production and efficiency at the worksite.

2.7 THE IMPACT OF EARTHMOVING CABIN CONDITIONS ON OPERATORS ON SITE

The issue of cabin is not addressed when accidents occur on site but it is one of the major factors aside other causes which attribute to most accidents onsite even though it is mostly ignored. For some time now, it has come to the notice of management and most equipment operators that, the condition of the cabin (favorable or not favorable) has contributed to most health-related problems such as back ache, cold, catarrh, neck pain, impaired vision among others. On most of the construction sites in Ghana, the cabin conditions of most equipment are in a deplorable state due to poor maintenance practice adopted on site.

A scenario is given of an equipment operator in his early 50s who met his untimely death when he jacked out of the equipment while it was in operation. It was believed that his seat belt was in a bad shape and his cabin was without windshield. This made it easier for him to be thrown out of the cabin causing his untimely and fatal death. This exposes plant operators to the dangers associated with not equipping the equipment with roll-over or falling object protective structures, and even if it is fixed with protective structures, the conditions should be favorable to avoid the increasing number of accidents occurring on the Ghanaian construction sites today.

From the observation at sites, it can be realized that there are various errors associated with the cabin conditions which has a threat to the operator and it doesn‟t make him feel comfortable when operating the equipment, which could lead to accidents onsite. The seat on which the operator sits to operate the equipment is in a deplorable state. The windscreen is also cracked and can cause the operator to lose focus on the area of operation. The air condition is not functioning and has caused the operator to use it as a place for keeping dusters. When it comes to the health of the operators, the conditions does not favor the operator to work in a hazard-free condition and when checks are not made to control or repair these faults, it can lead to major accidents onsite which can decrease the level of productivity and affect production.

2.8 SUMMARY OF CHAPTER

Earthmoving equipment as implied in the name is generally used for moving earth from one part of a construction site to another. Most construction projects require the movement of large amount of earth at the start of the project and sometimes whilst construction is in progress

Employers are required by law to protect their employees from existing, potential or new hazards that possess a threat to the employees. Safety must be ensured on construction sites at all times. In relation to the safety of machines, a faulty cabin condition possesses a lot of threats to equipment operators. It is advisable for equipment operators to do a thorough check around the equipment and in the cabin before it begins operation. Without safety, a lot of accidents take place during operation as a result of the missing seat belt in the cab. Each year, the number of onsite accident keep rising and nothing has been done to curb it. It is therefore expedient for plant operators and engineers to put in place measures that will help control these occurrences. We have various types of earthmoving equipment in our industries today. It can be used for cutting and loading earth using the same equipment. Earthmoving equipment are required to be fitted with the appropriate conditions in accordance to the health and safety manual of the equipment. Some of the conditions which are required to be present and also are expected to

be in good shape are; seat belt, seat adjuster, seat absorber, dash board, etc. The impact of poor cabin on the equipment operator could lead to an adverse effect on the health of the operator and also the environment. Some health problems such as impaired vision, catarrh, cough, back ache, joint pains etc. are as a result of poor cabin conditions. To improve these conditions, planned preventive maintenance must be practiced on construction sites. Regular checks on the equipment should be done daily, weekly or in extreme cases, fortnightly. Whenever failure is detected in the machine, it should be reported directly to the immediate supervisor or the one in charge. The condition of the cabin has contributed to most health-related issues on earthmoving equipment operators. Poor maintenance, incompetent personnel, unsafe attitude towards work, has resulted in earthmoving equipment cabin condition and how it‟s related to onsite accident.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter entails the methodology for collecting views on plant and equipment forms firms located in the Western and Central Region of Ghana. The survey adopted was by means of questionnaires distributed by personal hand-to-hand to gather data for this research. The questionnaire was designed based on information gathered from the various books, articles and journals read.

3.2 RESEARCH DESIGN

Particular group was targeted and the questionnaire was sent to be answered by them. Conclusions were drawn based on their responses. There are several strategies available such

as case study, surveys, experiments, etc. when it comes to research. But for this study, the focus was on research survey. Survey was used because it ensures a more accurate sample when gathering a finite frame/population from an infinite frame/population. This enables the researcher to draw conclusions and make important decisions.

Information from respondents was gathered from personally asking people questions. The reliability of the responses acquired from the survey depended on who the respondents are and how many of them, as well as how data collected were processed, analyzed, and interpreted. There are several approaches to conducting a survey but this research is limited by only personal hand-to-hand survey. The method adopted for the collection of data was both the quantitative and qualitative method. Since the research had to do with mostly commoners, a mixture of both methods had to be adopted. The strategy involved the use of a structured questionnaire which allowed the respondents to answer based on their views concerning the situation at hand. The researcher had to translate such views by responding to the questionnaire on their behalf.

3.3 SURVEY TARGET

The survey targeted respondents in some building and civil engineering construction sites in both regions, Takoradi and Cape Coast who owned earthmoving equipment since the number of equipment operators were unspecified. In this research, lists of respondents were derived from people already in the industry.

3.4 SOURCES OF DATA

The data for this research was collected from various sources to broaden the area of scope to enable a reliable conclusion to be drawn.

3.5 DATA COLLECTION

The data collected was sourced from both secondary and primary sources. Whereas secondary had to do with an already analyzed data such as books, journals and articles written by people, primary deals with the grass root of the situation (i.e., data obtained by the researcher through the questionnaire).

3.6 SAMPLE SIZE DETERMINATION

When determining the sample size for this research, a number of factors come into play. Some construction sites in the Western and Central region which owned equipment were visited to collect data on the research topic. Since the population size was indeterminate, purposive sampling method was adopted in arriving at eligible respondents from the lot.

Purposive sampling was adopted because there were not many operators

3.7 DISTRIBUTION AND COLLECTION OF DATA

Quite a number of equipment engineers and operators in the firms visited were allotted wellstructured questionnaires in order to collect their responses on the research topic. In spite of the challenges encountered, the process was successful with a total number of 50 questionnaires disseminated and 30 responded to.

3.7.1 QUESTIONNAIRE

Therefore, Questionnaires play a vital role in any survey. A set of questions were developed with the intention of enabling an orderly data collection. A set of thirty-three (31) questions were designed in accordance to precision and non-ambiguity to avoid a misconstruction and misconception of the questions and also provide a concise and vibrant answer.

3.7.2 DESIGN OF QUESTIONNAIRE

Based on the design of the questionnaire, the respondents were able to provide clear answers to the accurate and final set of questions given. To be able to achieve the required response,

proper attention was given to the structuring of the questionnaire. A draft context of the questionnaire was established at first which enabled the researcher with the help of his assistant construct a more presentable set of questionnaire which will enabled a detailed and more elaborate response to the research. Extensive reading was done through books, journals, and articles to know the standard condition of the earthmoving equipment cabin, its current state on our Ghanaian construction site, its relation to the health and safety of the equipment operators and recommendations to be made to curb these effects.

3.7.3 STRUCTURING THE QUESTIONNAIRE

The questionnaire was basically divided into four (5) sections for easy understanding and response;

Part A: Details of respondent

Part B: General information for equipment operators

Part C: Current conditions of earthmoving equipment cabins

Part D: Insurance Bonds and Legalities

PART E: Implications of Poor Cabin Conditions on Operators

PART F: Impact on Poor Cabin Conditions

3.1.3. DEMOGRAPHIC DATA

After the preamble is the first part of the survey which contains the details of the respondent; the name, role of respondent, field/department, address and telephone number. This section was provided even though it was optional. This was to enhance the credibility of the data.

Next, we had the section which gathered information from the equipment operators on the type of equipment they operated, the type of maintenance system practiced on site, etc. This formed the general information. The third section required the respondent to tell the researcher about the current conditions of earthmoving equipment cabins which included the dash board, seat adjuster, seat absorber, cabin light, among others. The likert rating scale was used to reduce the

appropriate ratings. A five-point rating scale was adopted which enabled the dependent variable to be ranked per their level of importance where a scale of 1-5 was used with; 1=excellent, 2=very good, 3=good, 4=credit and 5=pass.

3.1.4. DATA ANALYSIS

From the questionnaires, it was confirmed that they were fully useful. The data acquired were arranged in a logical manner for easy understanding and analyzed. The Statistical Package for Social Sciences (SPSS) software was used in computing the data. The statistical techniques used in analyzing the data obtained from the survey are descriptive statistics and mean score ranking.

3.1.5. SUMMARY OF THE CHAPTER

According to the faculty of Humanities study skills in Manchester, Al-Moghany, (2006), explained that a research design is the outline or a plan for a study used as a guidance in accumulating and interpreting data. In spite of several survey methods available such as case study and experiments, survey was used in centering the population and collecting data from them. The survey focused on some construction companies in the Western and Central regions who owned earthmoving equipment since the total number of equipment operators in the region are unknown. Information was collected by personal hand-to-hand distribution of questionnaires of which some were immediately collected and the rest collected at a later date. The primary source of data was through the questionnaire obtained first-hand. Sampling frame, a particular group of people were targeted (from building and civil construction companies in Takoradi who owned equipment) and the questionnaire administered to them to be answered. A number of factors had to be put in place to allow for ease of sample size determination. The engineers and equipment operators were administered the questionnaires. A total of 50 questionnaires were administered and 30 responded to. A set of thirty one (31) questions were

developed based on a clear and concise structure which allowed the questions to be easily understood and interpreted by the respondents. This allowed them to share their views on the standard conditions of earthmoving equipment cabins, its current state on our Ghanaian building and civil engineering construction site, its adverse effect on the health and safety of the operators and suggestions to curtail these effects. The questionnaires were divided into four (4) sections; Part A = Details of respondent (which was optional), Part B = General information for equipment operators, Part C = Insurance Bonds and Legalities and Part D = Implications of poor conditions on operators. A preamble was given before the questions followed. A likert scale of 1 – 5 was used, which was in a descending order with 1 = excellent, 5 = less average, 4=Average and 5 = Less Average

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This section introduces the analysis and discussion of findings after thoroughly going through the introduction, applicable literature, through to the methodology. The Statistical Package for Social Sciences version 21 (SPSS v 21) was used. The demographic data was analysed using descriptive statistics while the dependent variables were analysed using mean score index.

The first section of the questionnaire included the respondent‟s profile. The other sections gave a detailed analysis of what the entire research was all about. Fifty (50) questionnaires distributed to selected respondents in the building and civil engineering industry, comprising mainly men and only thirty (30) were responded to representing sixty percent (60%) of the feasibility study which were distributed and collected. The questionnaire formed the basis of the entire research outcome. A sample of the questionnaires can be seen in appendix A.

4.2ANALYZING OF DEMOGRAPHIC BACKGROUND

Table 4.1 Analysis of Demographic Data

Variable	Frequency	Percentage	Valid percent
Gender			
Valid Male	30	100.0	100.00
Marital status			
Valid Single	4	13.3	13.3
Married	26	86.7	86.7
Total	30	100.0	100.0
The age range			
Valid	18-25 7	23.3	23.3
	26-35 4	13.3	13.3
	36-45 5	16.7	16.7
	46-55 14	46.7	46.7
Total	30	100.0	100.0
Designation in the company			
Valid Junior operator			
Senior operator	2	6.7	6.7
Chief operator	21	70.0	70.0
Total	7	23.3	23.3
	30	100.0	100.0
Years working in the construction industry			
Valid	0-2 2	6.7	6.7
	3-5 7	23.3	23.3
	6-9 9	30.0	30.0
	10.00 12	40.0	40.0
Total	30	100.0	100.0

Training you have			
Valid Technical training	2	6.7	6.7
Apprenticeship training	28	93.3	93.3
Total	30	100.0	100.0
Acquired qualification			
Valid BECE	5	16.7	18.5
SSCE/WASSCE	2	6.7	7.4
MSLC	13	43.3	48.1
Proficiency excavator.	5	16.7	18.5 7.4
Earthmoving operator safety	2	6.7	100.0
Total	27	90.0	
Missing system	3	10.0	
Total	30	100.0	
Companies worked with			
Valid two	7	23.3 16.7	23.3 16.7
Three	5	20.0	20.0
Five	6	40.0	40.0
Many	12	100.0	100.0
Total	30		
Belong to trade any union			
Valid Yes	10	33.3	33.3
No	20	66.7	66.7
	30	100.0	
Total			100.0
If no why			
Valid now deciding to join	11	36.7	84.6
Not interested	2	6.7	15.4
Total	13	43.3	100.0
Missing system	17	56.7	
Total	30	100.0	

Years working in the present industry			
Valid 0-2	18	60.0 10.0	64.3 10.7
3-5	3	23.3	25.0
10 years & above	7	93.3	100.0
Total	28	6.7	
Missing system	2	100.0	
Total	30		

Source: Field work, 2016.

DISCUSSION

Demographic background

Table 4.2 shows the gender of the respondents. It is seen that all the respondents (100%) are males. This is indicative of the case of male dominance over females in this particular profession.

Marital status

Table 4.2 shows the marital status of the respondents. It is seen that majority of the respondents (86.7%) are married whilst the rest forming 13.3% are single and not yet married. It can therefore be seen that majority of the respondent are single

The age grange

Table 4.2 shows the age group of the respondents. It appears in that many of them are quiet matured and within age 46-55 (46.7%). Some of the respondents are also youthful within the age of 18-25 years (23.3%).

Designation in the company

Table 4.2 shows the various designations of the respondents in their place of work. It is seen that majority of them are senior operators (70%). This is quiet explainable due to the fact that many of these operators are between the ages of 46-55 years.

Years working in the construction industry

Table 4.2 shows the number of years the respondents have spent in the company. It is seen from **Table 4.2** that majority (40.0%) have spent over 10 years. The others have spent 6-9 years forming 30 percent. It is seen as well that a few have spent less than 2 years (6.7%).

Training you have

Table 4.2 shows the training received. It is seen that this ranged from apprenticeship to technical. Those who have received apprenticeship training formed the majority (93.3%). The rest have received technical training as well (6.7%). There was the need to find out the various qualification acquired by the operators.

Acquired qualification

It is not surprising as seen in **Table 4.2** that these include BECE (43.3%), MSLC (48.1%), proficiency excavator (18.5%) and earth moving operating safety (6.7%).

Companies worked with

Table 4.2 shows the number of companies respondents have worked with. It is seen that responses ranged from two to over six companies. Those who have worked over six companies were classified as many and they formed 40.0%. Those who have worked in five companies formed 20.0% with 23.3% who have worked in just two companies.

Operators belong to trade union

Table 4.2 shows whether the respondents belong to any trade unions. It is seen that many (66.7%) said they are not members of any trade unions. The rest (33.3%) however said that they belong to trade unions. On reasons for not joining any trade unions it is seen from.

If no why

Table 4.2 these include the fact that respondents are now deciding to join (84.6%) and just not interested (15.4%).

Years working in the present industry

Finally, there was the need to find out how long respondents have worked in the present industry. It is seen that many have worked under 2 years (64.3%). The remaining have worked between 3-5 years (10.7%) and over 10 years (23.3%) as seen in **Table 4.2.**

4.3 ANALYSIS OF THE NATURE OF EQUIPMENT OPERATING

Table 4.2 Analysis of Equipment Operated

Variable	Frequency	Percentage	Valid percent
The type of equipment operated			
Earth moving			
Excavating	14	46.7 13.3	46.7 13.3
Material handling	4	20.1 10.0	20.1 10.0
Lifting equipment	6	10.0	10.0
Motor Grader	3	100.0	100.0
Total	3		
	30		
The type of equipment operated often			
Bulldozer	11	36.7	36.7
Face shovel	2	6.7	6.7
Backacter	3	10.0 10.0	10.0 10.0
Skimmer	3	20.0	20.0
Dragline	6	16.7	16.7
Excavator	5	100.0	100.0
Total	30		

The company safety plans			
Plant equipment maintenance	8	26.7	32.0
Safety programme/Plan	10	33.3	40.0
Health& safety Management	2	6.7	8.0
Safety officer	5	16.7 83.3	20.0
Total	25	16.7	100.0
Missing system	5	100.0	
Total	30		

Type of maintenance system company practice			
Planned preventive maintenance	19	63.3 20.0	63.3 20.0
Planned corrective Maintenance	6	16.7	16.7
Unplanned/emergency Maintenance	5	100.0	100.0
Total	30		
License acquired to operate the equipment			
Yes	30	100.0	100.0
Yes	24	80.0 10.0	88.9
No	3	90.0	11.1
Total	27	10.0	100.0
Missing system	3	100.0	
Total	30		
Have fair idea about equipment (machine) anatomy			
Yes	22	73.3	73.3
No	8	26.7	26.7
Total	30	100.0	100.0
Operators Knowledge of uptime and downtime of equipment			
Valid Yes	22	73.3	73.3
No	8	26.7	26.7
Total	30	100.0	100.0

Source: Field work, 2016 **DISCUSSION OF OPEN ENDED QUESTION**

The type of equipment operated

Table 4.3 shows the nature of equipment operated. There was the need to know the type of equipment operated. It is seen in **Table 4.3** that these equipment are earth moving, excavating, material handling, lifting equipment and motor grader.

The type of equipment operated often

Table 4.3 shows that, many of the operators deal with earthmoving equipment (46.7%).

The company safety plans

On the equipment‟s safety plans, the company has, **Table 4.3** shows that these include plant equipment management (32.0%), safety programme plan (40.0%), health and safety management (8.0%) and safety officers (20.0%).

Type of maintenance system company practice

It is seen from **Table 4.3** that the types of maintenance system the company practice are quiet numerous. These include planned preventive maintenance (63.3%), planned corrective maintenance (20.0%) and unplanned emergency maintenance (16.7%).

License acquired to operate the equipment

It is seen from **Table 4.3** that all the operators (100%) have acquired the needed licenses.

Operators have fair idea about equipment (machine) anatomy

It is again seen from **Table 4.3** that majority of the operators have fair idea about equipment or machine anatomy (88.9%). Those with no idea formed a valid percent of 11.1.

Operators Knowledge of uptime and downtime of equipment

Table 4.3 shows that, there was the need to also find out the operators‟ knowledge of uptime and downtime of equipment. It is seen from **Table 4.3** that majority of respondents (73.3%) knew of this whilst just a few (26.7%) lacked knowledge about this.

4.4ANALYSIS OFCURRENT CONDITIONS OF EARTHMOVING EQUIPMENT CABINS

Table 4.3 Analyses of the Current Conditions of Earthmoving Equipment Cabins

Variable	Frequency	Percentage	Valid percent
The state of your Cabin equipment in terms of ergonomics			
Excellent	8	26.7	26.7
Very good	3	10.0	10.0
God	12	40.0	40.0
Very poor	7	23.3	23.3
Total	30	100.0	100.0
Check cabin conditions of the equipment			
Very often	24	80.0	80.0
Quiet often	4	13.3	13.3
Never	2	6.7	6.7
Total	30	100.0	100.0
The plant equipment have rollover protective structure or falling objects protective structure			
Yes	15	50.0	55.6
No	12	40.0	44.4
Total	27	90.0	100.0
Missing system	3	10.0	
Total	30	100.0	

The source of worker injury to the operator			
Lack of maintenance	5	16.7	16.7
Visual or ear impaired or poor levels driver or operator visibility	10	33.3	33.3
Work area topography	4	13.3	13.3
Unintentional exit from workplace transport	3	10.0	10.0
Carrying of passenger	2	6.7	6.7
Being run over	6	20.0	20.0
Total	30	100.0	100.0

Source: Field work, 2016

DISCUSSION OF OPEN ENDED QUESTION

The state of your Cabin equipment in terms of ergonomics

On the current conditions of earthmoving equipment it is seen from **table 4.4** that in terms ergonomics they are good (40.0%). Other points of view include excellent (26.7) and very poor (23.3%).

Operators checking cabin conditions of the equipment

On how often operators check cabin for their conditions, it is seen in **table 4.4** that it is don very often (20.8%).

Earthmoving equipment have rollover protective structure or fallen objects protective structure

Table 4.4 also indicates the availability of rollover protective structure to protect against fallen objects (55.6%).

Source of worker injury to the operator

On the sources of injuries to the operators of these machine. It is seen from **table 4.4** that these included lack of machines, visual or ear impaired or poor levels driver or operator visibility , work area topography, unintentional exist from work transport and carrying of passenger being run over.

4.5ANALYSIS OF INSURANCE BOND AND LEGALITIES

Table 4.4 Analyses of Insurance Bond and Legalities

Variable	Frequency	Percentage	Valid percent
Insurance			
Yes	15	50.0	50.0
No	15	50.0	50.0
Total	30	100.0	100.0
Awareness of workmen compensation law 1987 (PNDC 187)			
Yes	26	86.7	86.7
No	4	13.3	13.3
Total	30	100.0	100.0
Cabin provide you with clear and unrestricted view on area of operation			
Yes	21	70.0	86.7
No	9	30.0	13.3
Total	30	100.0	100.0

Source: Field work, 2016

DISCUSSION OF OPEN ENDED QUESTION

Operators insured

Table 4.5 shows that half of the respondents have insurance packages with half not having any insurance provisions.

Awareness of workmen compensation law 1987 (PNDC 187)

Table 4.5 also shows that majority of operators (86.7%) are aware of workmen compensation law 1987 (PNDC 187).

Cabin with clear and unrestricted view on area of operation

It is refreshing to note in **Table 4.5** that the cabins provide operators with clear and unrestricted view on area of operation (70.0%) that will help promote safety at work place.

4.6ANALYSIS OF CONDITIONS PERTAINING TO EARTHMOVING EQUIPMENT CABIN

Table 4.5 Analyses of Conditions Pertaining to Earthmoving Equipment Cabin

Variable	Frequency	Percentage	Valid percent
The conditions of mirrors			
Excellent	8	26.7	26.7
Very good	3	10.0	10.0
Good	2	6.7	6.7
Less average	17	56.7	56.7
Total	30	100.0	100.0
The conditions of seats			
Excellent	10	33.3	33.3
Very good	8	36.7	60.0
Good	6	20.0	80.0
Average	4	13.3	93.3
Less average	2	6.7	100.0
Total	30	100.0	
The conditions of seat belts			
Excellent	10	33.3	33.3
Very good	8	26.7	60.0
Good	6	20.0	80.0
Average	2	6.7	86.7
Less average	4	13.3	100.0
Total	30	100.0	
The floor condition			
Excellent	7	23.3	25.9
Very good	16	53.3	59.3
Average	2	6.7	7.4
Less average	2	6.7	7.4
Total	27	90.0	100.0
Missing system	3	10.0	
Total	30	100.0	

The space in cabin			
Excellent	5	16.7	20.8
Very good	12	40.0	50.0
Good	3	10.0	12.5
Average	4	13.3	16.7
Total	24	80.0	100.0
Missing system	6	20.0	
Total	30	100.0	
Lightening system conditions			
Excellent	2	6.7	9.5
Very good	3	10.0	14.3
Good	9	30.0	19.0
Average	4	13.3	14.3
Total	3	10.0	100.0
Missing system	21	70.0	
Less average	9	30.0	
Total	30	100.0	
Widowssystem condition			
Excellent	5	16.7	23.8
Very good	9	30.0	42.9
Average	7	23.3	33.3
Total	21	70.0	100.0
Missing System	9	30.0	
Total	30	100.0	
Visibility through the windscreen condition			
Excellent	5	16.7	36.3
Very good	5	16.7	26.3
Average	7	23.3	36.8
Total	2	6.7	10.5
Missing System	19	63.3	100.0
Total	11	36.7	
	30	100.0	

Warning notice/mutual to the operator			
Excellent	5	16.7	23.8
Very good	3	10.0	14.3
Good	2	6.7	9.5
Average	11	36.7	52.4
Total	21	70.0	100.0
Missing System	9	30.0	
Total	30	100.0	
Firefighting equipment			
Excellent	5	16.7	23.8
Very good	5	16.7	23.8
Good	2	6.7	9.5
Average	9	30.0	42.9
Total	21	70.0	100.0
Missing System	9	30.0	
Total	30	100.0	

Source: Field work, 2016 **DISCUSSION OF OPEN ENDED QUESTION**

The conditions of mirrors

Table 4.6 shows on the conditions pertaining to equipment. It is seen that with respect to mirrors many thought it was less than average (56.7%). Those who agreed that it was excellent formed (26.7%).

The conditions of seats

Table 4.6 also indicates that the seat condition was also excellent with many of the operators agreeing to this state of affairs. This is closely followed by those who said it was very good (26.7%). Seat belts are very important to every vehicle operator and most especially those operating heavy equipment and machinery.

The conditions of seat belts

In view of this **Table 4.6** presents data on the conditions of seat belts. It is seen that many said they were in excellent condition (33.3%), very good (26.7%) and good (20.0%).

The floor condition

Table 4.6 also shows that the floor conditions are very good (40.7%) and average (25.9%). The dashboard was also found to be in very good condition (59.3%), and excellent condition (25.9%).

The space in cabin

Table 4.6 concerns the space in the cabin. It is seen that this ranged from very good (50.0%), excellent (20.8%), average (16.7%) and good (12.5%).

Lightening system conditions

Table 4.6 shows that the lightening systems are in good condition as respondents who attested to this formed 42.9%. Those who found it to be less average formed 14.3% and others said it was excellent (9.5%).

Widow's system condition

The windows system conditions were as show in **Table 4.6** were very good (42.9%), excellent (23.8%) and average (33.3%).

Visibility through the windscreen condition

Table 4.6 shows that visibility through the wind condition was average (36.8%). Others said it was excellent (23.3%), very good (26.3%) and less average (6.7%).

Warning notice/mutual to the operators

Table 4.6 shows that the warning notices to the operators were less than average meaning a lot needs to be done to bring it up to the desired level. The need to fight fire effectively is a very important point.

Firefighting equipment

Table 4.6 shows that the equipment to be used to fight fire were less than average (42.9%).

4.7ANALYSIS OF POOR CABIN CONDITIONS ON RESPIRATIONS

Table 4.6 Analyses of Poor Cabin Conditions on Respiration

Variable	Frequency	Percentage	Valid percent
Impact on Cabin Conditions on Respirations			
Less critical	2	6.7	22.2 55.6
Average Critical	5	16.7	22.2
Very critical	2	6.7	100.0
Total	9	30.0	
Missing system	21	70.0	
Impact on Poor Cabin Conditions on Chronic Irritation of Lungs			
Less critical	3	10.0 23.3	13.0
Average	7	43.3 76.7	30.4
Critical	13	23.3	56.5
Very critical	23	100.0	100.0
Total	7		
Missing system	30		
Impact on poor cabin conditions on cold and catarrh			
Not critical	2	6.7	7.4
Less critical	5	16.7	18.5
Average critical	2	6.7	7.4
Critical	5	16.7 43.7	18.5
Very critical	13	90.0	48.1
Total	27	10.0	100.0
Missing system	3	100.0	
Total	30		
Impact on poor cabin conditions on asthma			
Not critical	8	26.7 20.0	29.6
Less critical	6	20.0 23.3	22.2
Average	6	90.0	22.2
Critical	7	10.0	25.9
Total	27	100.0	100.0
Missing system	3		
Total	30		

Impact on poor cabin conditions on allergies			
Not critical	2	6.7	18.2
Less critical	2	6.7	18.25
Average	4	13.3 10.0	36.4
Critical	3	36.7	27.3
Total	11	63.3	100.0
Missing system	19	100.0	
Total	30		
Impact on poor cabin conditions on malaria			
Not critical	2	6.7	6.7
Critical	5	16.7 50.0	16.7
Critical	15	26.7	50.0
Very	8	100.0	26.7
Total	30		100.0
Impact on poor cabin conditions on backache			
Less critical	2	3.7	6.7
Average Critical	2	6.7	6.7
Critical	17	56.7	56.7
Very critical	9	30.0	30.0
Total	30	100.0	100.0
Impact on poor cabin conditions on body pains			
Less critical	2	3.7	6.7
Average critical	4	13.3 23.3	13.3
Critical	7	56.7	23.3
Very critical	17	100.0	56.7
Total	30		100.0

Impact on poor cabin conditions on waist pains			
Less critical	6	20.0 23.3	22.2
Critical	7	46.7 90.0	25.9
Very critical	14	10.0	51.9
Total	27	100.0	100.0
Missing system	3		
Total	30		
Impact on poor cabin condition on shoulder pain			
Not critical	4	13.3	14.8
Less critical	7	23.3	40.7
Average critical	2	6.7	48.1
Critical	14	46.7 90.0	100.0
Total	27	10.0	
Missing total	3	100.0	
Total	30		

Source: Field work, 2016

DISCUSSION OF OPEN ENDED QUESTION

Impact on Cabin Conditions on Respirations

Table 4.7 shows that poor cabin condition‟s effect respiration is averagely critical (55.6%).

Impact on Poor Cabin Conditions on Chronic Irritation of Lungs

Table 4.7 shows that the poor cabin condition on chronic irritation of lungs is quiet critical (56.5%). This is followed by averagely critical (30.4%).

Impact on poor cabin conditions on cold and catarrh

Table 4.7 shows that the impact of poor cabin conditions on cold and catarrh is very critical (48.1%). This is followed by critical (18.5%), less critical (18.5%).

Impact on poor cabin conditions on asthma

The effect of poor cabin condition and asthma was also investigated. It is seen from **Table 4.7** that this is not that critical (29.6%), critical (25.9%), and average critical (22.2%).

Impact on poor cabin conditions on allergies

The impact of poor cabin conditions on sleeplessness was also ascertained by the present study. It is seen from **Table 4.7** that this is critical (66.7%).

Impact on poor cabin conditions on malaria

Table 4.7 shows that poor cabin conditions‟ effect on allergies is averagely critical (36.4).

Table 4.7 shows that poor cabin conditions have an effect on malaria (50.0%).

Impact on poor cabin conditions on backache

Table 4.7 shows that poor cabin conditions have an effect on backache. This is seen because the respondents saw this to be critical (56.7%). Those who saw this to be very critical formed 30.7%.

Impact on poor cabin conditions on body pains

It was of interest to find out if poor cabin conditions have impact on body pains. It is seen from **Table 4.7** that those who agreed to this as very critical formed 56.7%.

Impact on poor cabin conditions on waist pains

Table 4.7 shows that poor cabin conditions affected waist pains. It is seen accordingly that those who saw this to be very critical formed 51.9%.

Impact on poor cabin condition on shoulder pain

Table 4.7 shows that the poor cabin condition does affect shoulder pain. It is seen that many of the respondents (51.9%) found this to be critical.

4.8 ANALYSIS OF IMPROVING CABIN CONDITIONS

Table 4.7 Analysis of Improving Cabin Conditions

Variable	Frequency	Percentage	Valid percent

Improving Cabin Conditions			
Working hours should be reduced to about four with 2 hour break	5	16.7	16.7
There should be air condition	2	6.7	6.7
There should be manual lightening system	2	6.7	6.7
Need a sound system	2	6.7	6.7
Need a protective clothing	3	10.0	10.0
Provide fire extinguishers	11	36.7	36.7
Seat system should be improved	5	16.7	16.7
Total	30	100.0	100.0

Source: Field work, 2016

DISCUSSION OF OPEN ENDED QUESTION

Improving in Cabin Conditions

This is where the respondents were given an opportunity to share their grievances to comment, and make suggestions about the aspects that needs improvement in order to safe guard humanities thus, operator‟s health and safety, by writing.

On the way forward to move cabin conditions forward it is seen that there is the need for working hours to be reduced to about 4 hours with 2 hours break, there should be air condition,

there should be manual lightening system, sound system, protective clothing, provide fire extinguishers and seat system should be improved.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents the summary of findings of the data collected from the respondents in the field. It further concludes the study and makes supplementary recommendations on strategies to be implemented to ensure the safe condition of earthmoving equipment cabin and avoid its negative impact on the health and safety of the operators. This study further on explains the limitations encountered in the research and also makes recommendations for advance research.

5.2 SUMMARY OF FINDINGS

- The types of equipment operated are earthmoving, excavating, material handling, lifting equipment and motor grader. However many of the operators deal with earth moving equipment.
- The operators have duly acquired licenses. The equipment used by the operators have cabins fixed. Equipment operated often includes bulldozer, face shovel, backwater, skimmer, dragline, excavator among others. The companies also have technicians who detect and deal with faults as and when they do occur.
- On the equipment safety plan of the companies this was found to include plant equipment management, safety programme plan, health and safety management.
- The types of maintenance system the companies practice include planned preventive maintenance, planned corrective maintenance and unplanned emergency maintenance.
- Operators have fair idea about equipment or machine anatomy. Operators‟ knowledge of uptime and downtime was quite high.
- On the current conditions of earthmoving equipment in terms of ergonomics was seen to be good.

- Operators check cabin for their conditions very often. There is availability of rollover protective structure to protect against falling objects.
- On the sources of injuries to the operators of these machines these include lack of maintenance, visual or ear impaired or poor levels driver or operator visibility, work area topography, unintentional exit from work place transport and carrying of passenger being run over.
- On insurance, half of the respondents have insurance packages with half not having any insurance provisions and in addition majority of operators are aware of workmen compensation law 1987 (PNDC 187). The cabins provide operators with clear and unrestricted view on area of operation to help promote safety at work place. .
- The seat conditions are excellent with many of the operators agreeing to this state of affairs.
- The floor conditions and dashboard are also very good with good space in the cabin.
- It can also be said that the lightening system are in good condition similar to the windows system conditions.
- Visibility through the windscreen condition was average just like the equipment used to fight fire.
- On the effects of poor cabin conditions it was found out that poor cabin condition"s effect on respiration is averagely critical, poor cabin condition on chronic irritation of lungs is quiet critical.
- The impact of poor cabin conditions on cold and catarrh is very critical.
- The impact of poor cabin conditions on sleeplessness was also ascertained by the present study to be critical and effects on allergies are averagely critical.
- There is also effect on malaria and backache.
- The effect on body pains turned up to be critical.

- On waist pains the effects were seen to be very critical and critical for shoulder pain.
- On the way forward to move cabin conditions forward it is seen that there is the need for working hours to be reduced to about 4 hours with 2 hours break, there should be air condition, there should be manual lightening system, need a sound system, need protective clothing, provide fire extinguishers and seat system should be improved.

5.3 CONCLUSIONS

The type of equipment operated includes earthmoving, excavating, material handling, lifting equipment and motor grader. Many of the operators deal with earth moving equipment. And the operators have duly acquired licenses. The equipment used by the operators have cabins fixed. Equipment operated often include bulldozer, face shovel, back actor, skimmer, dragline, excavator among others. The companies also have technicians who detect and deal with faults as and when they do occur. The equipment safety plan of the companies include plant equipment management, safety programme plan, health and safety management. The types of maintenance system the company practice include planned preventive maintenance, planned corrective maintenance and unplanned emergency maintenance.

Operators have fair idea about equipment or machine anatomy. Operators‟ knowledge of uptime and downtime was quiet high.

Current conditions of earth moving equipment in terms of ergonomics are good. Operators check cabin for their conditions very often. There is availability of rollover protective structure to protect against falling objects. On the sources of injuries to the operators of these lack of maintenance, visual or ear impaired or poor levels driver or operator visibility, work area topography, unintentional exit from work place transport and carrying of passenger being run over are some sources of injuries. On insurance half of the respondents have insurance packages with half not having any insurance provisions and in addition majority of operators are aware

of workmen compensation law 1987 (PNDC 187). The cabins provide operators with clear and unrestricted view on area of operation help promote safety at work place.

Mirrors conditions are less than average though a few are excellent. The seat conditions are excellent. The floor conditions and dashboard are also very good with good space in the cabin. It can also be said that the lightening system are in good condition similar to the windows system conditions. Visibility through the wind condition was average just like the equipment used to fight fire.

Poor cabin condition‟s effect on respiration is averagely critical, poor cabin condition on chronic irritation of lungs is quiet critical. The impact of poor cabin conditions on cold and catarrh is very critical. The impact of poor cabin conditions on sleeplessness was also ascertained by the present study to be critical and effects on allergies are averagely critical. There is also effect on malaria and backache. The effect on body pains turned up to be critical. On waist pains the effects were seen to be very critical and critical for shoulder pain.

To improve cabin condition there is the need for working hours be reduced to about four with 2 hours break, there should be air condition, there should be manual lightening system, need a sound system, need protective clothing, provide fire extinguishers and seat system should be improved.

5.4 RECOMMENDATIONS

Putting strategies in place to help curb these poor conditions on the health and safety of equipment operators, it is expedient that the employers put measures which will eliminate or better still reduce the level of impact of poor conditions on the operators. The recommendation to help improve the poor cabin conditions are as follows;

- Equipment operators should be educated on the hazards associated with operating earthmoving equipment.

- There should be situations where equipment operators will be trained on-the-job.
- At other times, off-the-job training such as classroom lecture, films and videos, simulation exercises can be used to train the equipment operators.
- Also, employers of equipment operators should ensure that, they fix the earthmoving equipment with well-structured Roll-Over Protective Structure (ROPS) or Falling-Object Protective Structure (FOPS).
- They should also ensure that, the cabin contains seat belt, seat adjusters, seat absorbers, brakes, dash board, roof, floor, door and window condition. This will prevent the operator from crushing to death when an accident occurs. It will also protect the operator from the harsh conditions of the environment.
- Planned preventive maintenance should be practiced on the equipment. This will help in the early detection of any of the condition absent in the cabin which will cause a threat to the equipment operator. Early detection means, early fixation of the missing factor.
- Equipment which have exhausted their lifespan should not be allowed to operate anymore. Safety officers are charged to ensure that, such equipment are removed out of service and replaced with new ones.
- Lightening system should be improved on the various equipments
- There is the need to provide sufficient fire fighting devices
- Working hours should be reduced with ample break times
- Insurance packages should be provided

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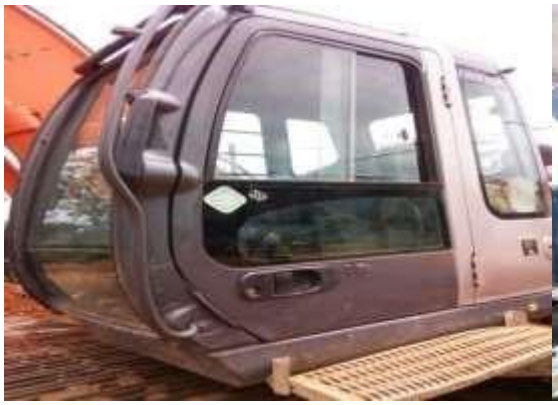
APPENDICES

APPENDIX A

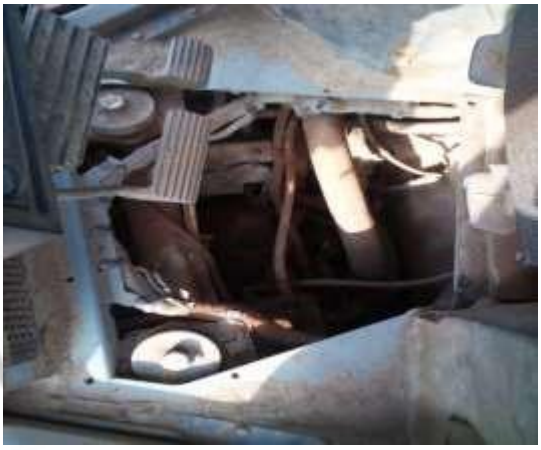
PICTURES INDICATING THE POOR CONDITIONS OF SOME EARTHMOVING EQUIPMENT CABINS IN THE BUILDING AND CIVIL ENGINEERING CONSTRUCTION SITES IN TAKORADI AND CAPE COAST



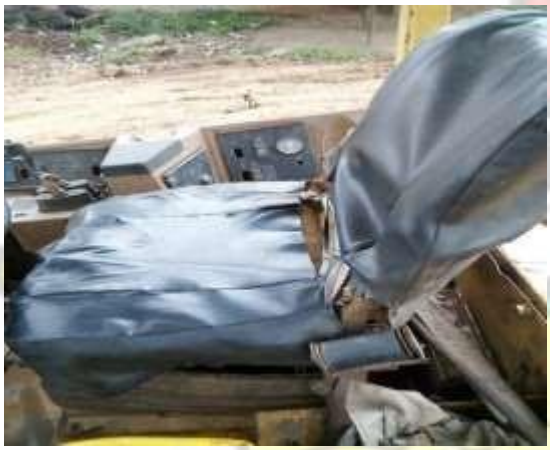

The details of the cross-sectional views of poor cabin conditions for both internal and external


Broken cabin windscreen **broken windscreen**

Broken screen

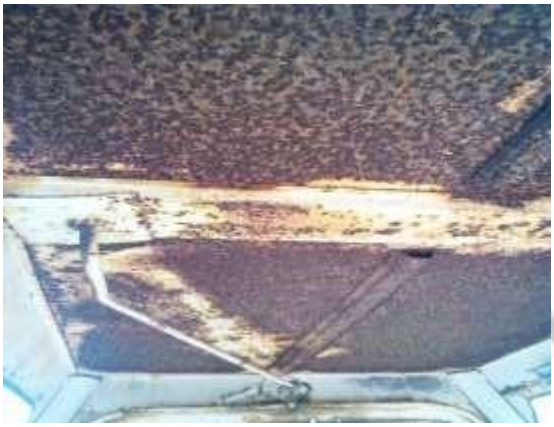


Detoriated cabin floor



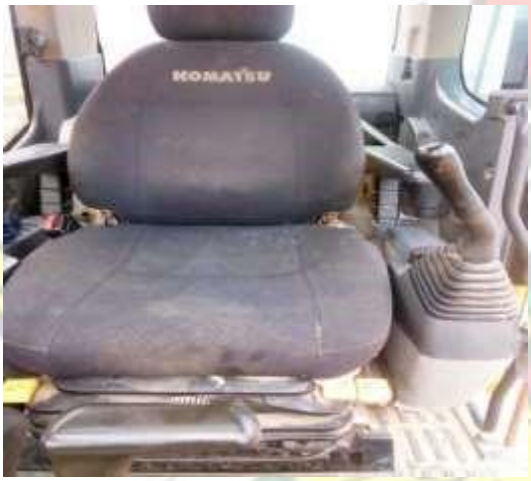
Spoilt cabin seats

Detoriated cabin floors



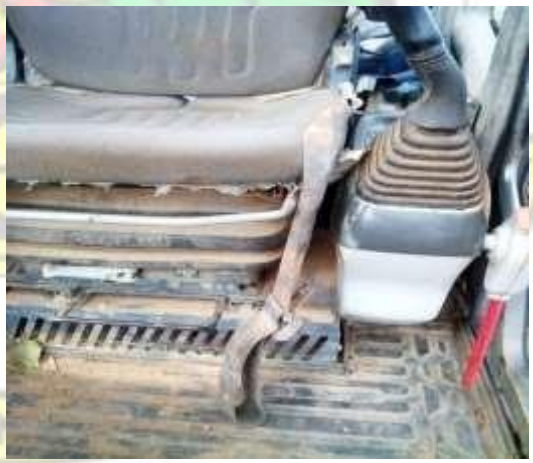
The poor nature of cabin roofs

poor cabin roof



Unsafe cabin seat

Spoilt cabin belt (unsafe)



Cabin floor **Cabin floor**

Poor state of control board **Poor state of control board**

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI-GHANA
COLLEGE OF ART AND BUILT ENVIRONMENT

DEPARTMENT OF BUILDING TECHNOLOGY

RESEARCH QUESTIONNAIRE

Research Topic: "earthmoving equipment cabin conditions and its health and safety implications on operators"

Questionnaire for earthmoving equipment operations in the construction industries

Dear Sir/Madam

Introduction

This questionnaire is to seek the views of operators of Earthmoving Equipment regarding the conditions of their cabins and its implications on their health and safety.

I am a final year student of Kwame Nkrumah University of Science and Technology (KNUST) pursuing MASTER OF SCIENCE (MSc) degree in CONSTRUCTION MANAGEMENT and currently undertaking my final year research project.

The information that would be obtained shall be used to examine whether "CABIN CONDITIONS" has any potential danger on the operators as far as Health and safety is concern.

The study is exclusively for academic purpose and any information provided shall be treated as confidential.

Thank you for your cooperation

Yours faithfully,

Francis Cudjoe
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If you have any question or help, don"t hesitate to contact my dynamic project supervisor Dr. Emmanuel Adinyira.

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SECTION A" DEMOGRAPHICDATA

General Information

Please tick in the appropriate box [√] (**Select all that apply**)

1. Are you male or female? **Please tick only one (√)**

   Male [ ] female [ ]

2. Marital status. **Please tick only one (√)**

   Single [ ] married [ ]

3. What is your designation in this company? **Please tick only one (√)** Junior Operator [ ] Senior Operator [ ] Chief Operator [ ]

4. How long have you been working in the construction industry? **Please tick only one (√)**

   0-2 years [ ] 3-5 years [ ] 6-9 years [ ] 10- years [ ] and above [ ]

5. What form of training or education level do you have? **Please tick only one (√)**

   Technical training [ ] Apprenticeship Training [ ]

   Polytechnic Training [ ] University Training [ ]

6. Which of these qualifications have you acquired? **Please tick only one (√)**

   BECE [ ] NVTI [ ] Intermediate [ ]

   SSCE/WASSCE [ ] Technician Part I [ ] Technician Part II [ ] Technician Part III [ ] HND [ ] BSc [ ]

   MSc. [ ] M.PHIL [ ] PHD [ ] OTD [ ]

   Any other specify ……..

   None of the above [ ]

7. How many companies have you ever worked with aside your present company?

   Please tick only one (√)

   One [ ] Two [ ] Three [ ] Four [ ] Five [ ]

Many [ ] none apart from this [ ]

8. Do you belong to any of the trade union in the construction industry?

Please tick only one (√)

Yes [ ] No [ ]

9. If No why?

Now deciding to join one [ ] Not interested [ ]

10. For how long have you been working in this present company? **Please tick only one (√)**

0-2 years [ ] 3-5 years [ ]

6-9years [ ] 10 years and above can‟t remember [ ]

11. Which of the ages below do you fall? **Please tick only one (√)**

18 – 25 [ ] 26 -35 [ ] 36 – 45[ ]

46 – 55[ ] 56 and above [ ]

SECTION A Ends the Questionnaires for the Demographic Of the Respondent

SECTION B: GENERAL INFORMATION FOR EQUIPMENT OPERATOR

12. What type of plant/equipment do you operate currently? **Please tick only one (√)**

Earthmoving Equipment [ ] Excavating Equipment [ ]

Material Handling Equipment [ ] Lifting Equipment [ ]

Any other specify……..

13. Does your equipment have Cabin? **Please tick only one (√)**

Yes [ ] No [ ]

14. Which of these plant/equipment do you operate most often? **Please tick as many as apply (√)**

Bulldozer [ ] Grader [ ] Face shovel [ ]

Backacter [ ]

Skimmer [ ] Dragline [ ] Trencher [ ]

15. Do you have any idea about how your company acquires the plant/equipment? **Please tick only one (√)**

Yes [ ] No [ ]

16. If yes, indicate from the following: **Please tick as many as apply (√)**

By out righting purchase (owing) [ ] By leasing [ ] By hiring [ ] Lending/Borrowing from colleagues companies [ ]

17. Do you have technicians and engineers available who work on the equipment cabin when fault is detected?

Yes [ ] No [ ]

18. Does the company have the following in place? **Please tick as many as apply (√)**

Plant equipment management [ ] Safety programme/Plan [ ]

Legal trademark for OHS in Ghana [ ] Health and safety management [ ]

Safety officer [ ]

19. What type of maintenance system does your company practice?

Please tick only one (√)

Planned Preventive Maintenance (PPM); [ ]

Planned Corrective Maintenance (PCM); [ ]

Unplanned / Emergency Maintenance (reactive) [ ]

20. How often does maintenance work take place on the equipment?

Please tick only one (√)

Very often [ ] Quit often [ ] Periodical base [ ] Once in a year [ ]

21. Have you acquired any license to operate the equipment? **Please tick only one (√)**

Yes [ ] No. [ ]

22. Do you have a fair idea about equipment (machine) Anatomy?

Please tick only one (√)

Yes [ ] No [ ] If yes what does it

mean…….....

23. Do you have knowledge about up time and down time of equipment?

Please tick only one (√)

Yes [ ] No [ ] If yes what does it

mean…….....

SECTION C: CURRENT CONDITIONS OF EARTHMOVING EQUIPMENT CABINS

24. How do you find the state of your Cabin equipment and the manufacturing design in terms of ergonomics?

Excellent [ ] Very Good [ ] Good [ ] Poor [ ] VeryPoor[ ]

25. How often do you check the cabin condition of the equipment?

Please tick only one (√)

Very Often [ ] Quit Often [ ] Seldom [ ] Never [ ]

26. Is the plant equipment with Role-Over Protective Structure (ROPS) or Falling-Objects Protective Structure (FOPS)? **Please tick only one (√)**

Yes [ ] No [ ]

Which of the following do you see as the main source of worker injury to the operator?

Lack of maintenance [ ]

Visual or ear impaired or poor levels driver or operator visibility [ ]

Work area topography [ ] Unintentional exist from work place transport [ ]

Carrying of passenger [ ] Being run over [ ]

Structure by part of the work place transport [ ]

SECTION D: INSURANCE BONDS AND LEGALITIES

27. Are you insured or any form of welfare packages for you?

    Please tick only one (√)

    Yes [ ] No [ ] If any other specify…….

28. Are you aware of workmen"s compensation law 1987 (PNDC 187 which relates to compensation for personal injuries? **Please tick only one (√)**

    Yes [ ] No [ ]

29. Does the cabin provide you with a clear and unrestricted view on the area of operations?

    Please tick only one (√)

    Yes [ ] No [ ]

SECTION E

The table below shows some conditions pertaining to the cabin of your equipment. Indicate if these conditions are present or not and rate their status on the scale provided.

1 = excellent, 2 = very good, 3 = good, 4 = average, less average

Conditions	**Yes**	**No**	**If yes, please rate.**				
			1	**2**	**3**	**4**	**5**
Mirrors							
Seats							
Seat belt							
Seat adjuster							
Floor condition							

Dash board							
Space in the cabin (size)							
Height in the cabin							
Roof condition							
Lighten system or fittings							
Warning light systems							
Window conditions							
Seat absorbers							
Visibility through the wind screen							
Warning notice / manual to the operator							
Firefighting equipment (extinguisher)							
Air Condition							
Control board							

SECTION F: IMPACT O F POOR CABIN CONDITIONS ON OPERATIONS

In connection with health hazards on operators, the list below shows some probable impact of these conditions on the operators. Please rate by indicating how critical these conditions are as result if the condition of the cabins. Please tick (√) the appropriate number. 1-Not Critical, 2-Less Critical, 3- Average Critical, 4-Critical and 5-Very Critical.

Side effects	**1**	**2**	**3**	**4**	**5**
1. Respiratory disorder					
2. Chronic irritation of lungs					
3. Cold and catarrh					
4. Asthma					
5. Sleeplessness					
6. Stress effects					
7. Allergies					
8. Malaria					

9. Back ache					
10. Body pain					
11. Waist pain					
12. Chest pain					
13. Cough					
14. Sneezing/ catarrh					
15. Impaired vision					
16. Knee pain					
17. Shoulder pain					
18. Ear pain					

If you are given an opportunity to comment about aspects that need improvement in cabin conditions, suggest your opinion by writing.

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I want to say a very big thank you for spending your valuable and precious time with me. I am very positive that the information given me will go a long way in helping me in my research. Once again, I am so grateful for your immense support.