# KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,

# KUMASI, GHANA

Impact of Stress on the Occurrence of Accidents on Construction Sites in Ghana

by

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A Thesis submitted to the Department of Building Technology, College of Art and Built Environment in partial fulfilment of the requirement for the degree of

MASTER OF SCIENCE

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# DECLARATION

I hereby declare that this submission is my own work towards the MSc 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 any other degree of the University, except where due acknowledgement has been made in the text.

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#### ABSTRACT

Organizational stress in Construction has been noted to be on the rise due to several antecedents such as; ambitious deadline, work load, role conflict, poor communication, working in dangerous environment etc. One of the noted denouements of stress is the causation of accidents on construction sites. The study aimed at investigating the impact of stress on the numerous accidents that occur on construction sites in Ghana. Deductive approach to research, together with Quantitative research methods were used to address the research objectives. The aim was achieved by using (n = 204) data obtained from construction site workers in Ghana. The data attained was analyzed using SEM and RII together with mean score ranking. Data on the job related stressors showed ambitious deadlines, low salary and working in dangerous environment to be the stressors causing the most stress on construction workers in Ghana. The overall impact of the job stressors on accident occurrence achieved was 0.968 (96.8%) which denotes a very high influence. Results from the Structural Equation Model (SEM) showed workload to be the stressor impacting the most (79%) on accidents occurring on construction sites. Stepping on sharp objects was noted to be the accident that occurs mostly as a result of work place stress. The findings suggest organizations provide realistic and standard deadlines for construction projects so as to reduce the pressure mounted on the site workers to complete their work packages.



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#### **CHAPTER ONE**

#### **INTRODUCTION TO THE RESEARCH**

# **1.1 BACKGROUND**

According to Health and Safety Authority (2011) stress is a negative state which embroils varying degrees of anxiety, fear and agitation. It comes about when a person is asked to perform an activity or task which exceeds his ability. Stress at the individual level, as explained by Yao *et al.* (2015) can be related to several factors; physical, behavioral, psychological and other factors. Selye (1936) firstly introduced the stress concept in life science. He defined stress as the dynamism, pressure, or force imperiled upon an individual who tries to resists these forces, but uphold his true state.

Workplace stress is not always considered to be an entirely bad thing. For instance, Canadian Centre for Occupational Health and Safety (2012) perceived certain phase of stress to be normal. In reality, it is often what provides workers the energy and motivation to carry out their daily activities. Stress in this kind of state is considered good since it helps the workers "face" their daily challenges and meet their set goals such as deadlines, production targets, or finding new clients. However, as the saying goes, "too much of everything is bad", so is too much stress also harmful to the body. According to Amankwah *et al.* (2015), stress most at times starts from the house and lingers to the workplace. This is because most employees experience stress as the work load placed on them do not match the resources available to meet their needs, thereby affecting productivity. Leung *et al.* (2011) noted construction projects to be very intricate, involving different complex steps and techniques at both the design and construction stages.

Kheni *et al.* (2008) ranked construction industry as one of the most hazardous industries with frequent accidents and health related problems. The Labour Department (2000) report on health

and safety revealed that, 56 fatal accidents were recorded out of a total of 902 accidents that occurred on construction sites in the year 2000. Most of these accidents start as a result of unmanaged work place stress which develop into burnout and advanced stress. Enshassi *et al.* (2015) agreed with Leung *et al.* (2011) that the construction industry is considered to be a stressful industry, which impacts the safety performance of construction personnel, especially when the stress develops into burnout.

Stress and its impact on the construction industry is considered to be slightly different from other work related stress experienced in other professions. This difference can be attributed to the physical environment of the workplace, the construction methods available, nature of the construction work operations, construction materials, heavy equipment and tools used on construction sites, and other physical properties of the construction project.

#### **1.2 THE PROBLEM STATEMENT**

According to Addy & Cofie (2014) the construction industry constitutes a large part of the economy, contributing about 5 to 10 percent of Gross Domestic Product (GDP). It also constitute up to about 10 percent of the working population in the country. The construction industry, being a big contributor to the country"s economy needs to be managed very well to avoid circumstances of accidents which affects the production rate. Industrial accidents and injuries contribute enormously to the cost of a construction project. According to the International Labour Office, over 120 million industrial accidents occur in developing nations each year, with over 200,000 fatalities (International Labour Organization, 2003). This proves that health and safety in the construction industry is not given much attention in this part of the world.

Enshassi *et al.* (2015) agreed with Leung *et al.* (2011) that the construction industry is considered to be a stressful industry, which impacts the safety performance of construction

personnel, especially when the stress develops into burnout. Survey carried out by the Chartered Institute of Building (CIOB) showed 84 percent of their respondents, who mostly have over six years experience in the industry, felt that stress was a factor for poor retention levels in the construction industry (Campbell, 2006). Leung *et al.* (2011) also noted construction projects to be very intricate, involving different complex steps and techniques at both design and construction stages. This has accounted for the rampant occurrence of accidents on our job sites.

Stress, as stated by Fimian *et al.* (2009), is the second most reported work-related health problem and the number of people who suffer from stress-related conditions instigated by work is likely to increase. The results from European Agency"s research carried out in 2002 showed that, work-related stress placed second most common work-related health problem in the European Union, after back pain, affecting nearly one out of every three workers. Work related stress can happen in any sector no matter the level you work.

Bowen *et al.* (2013) investigated the nature and magnitude of stress experienced by construction workers in South Africa. The survey results placed Architects to be the most affected persons in terms of work stress, followed by engineers, quantity surveyors and construction managers. The study also concluded that female professionals were more likely to experience work place stress than their male counterparts. Due to the extensive impact of stress and its effects on construction workers, a lot of research is being carried out to help solve the problem. Kokt & Ramarumo (2015) focused their study on the effect of organizational culture on job stress and burnout as related to graded housing establishments. The study revealed that employees that are incessantly subjected to a challenging work environment have a high tendency to experience higher stages of stress which could initiate their resignation from such an industry totally.

Aside all the studies and research conducted on stress, very little research has been conducted here in Ghana. Most job stress theories were originated from the Western world, where countless studies are being executed. Annan (2014) stated that most firms spend much time tracing injury and illness statistics, reporting these statistics and comparing them to some unprofessional standards without properly updating them to their company"s risk profile. The government agencies are not exceptions to this trend. He concluded that companies must get their own personalized company profile where they can check the stress levels of their workers and address their condition accordingly. Taking our local construction industries into account, the antecedent that contribute mainly to workplace stress are all present and even at higher levels in the Ghanaian construction industry. The type of construction work operations we carry out, the physical environment of the workplace, lack of appropriate equipment and tools, the use of humans to carry out operations that ought to be done by machines and many other factors all add up to the high risk of stress in our industry here in Ghana.

According to the World Health Organization (2007) pressure is noted to be unescapable as a result of the aggravations of the present work environment. For this reason it is very important to localize the study to our sub region and access how these stress factors affect the workers here. The works of Enshassi *et al.* (2015); Leung *et al.* (2011); Campbell 2006; Bowen *et al.* (2013); Kokt & Ramarumo (2015); Idris *et al.* (2010) and World Health Organization on stress cannot be wholly applied in Ghana since they were conducted under different settings with different work conditions. A similar study conducted by Agyemang *et al.* (2014), fixated primarily on the manufacturing industry which is dissimilar in many ways from the construction industry. It was recommended that, more empirical studies need to be conducted to assess and analyze the stress phenomena so as to provide direction for policy makers and also inform managerial strategy.

From the works discussed above, it is evident that a geographical gap exist. Most of the studies were done in the USA and Europe where the techniques and methods used in construction is slightly different from what we have in Ghana. Also, no research has been conducted to actually find out how workplace stress contributes to the various accidents that occur on the construction sites. In this light, it is appropriate to conduct a research to determine the contribution of stress in the causation of accidents on construction sites in Ghana.

# **1.3 RESEARCH QUESTIONS**

Nenty (2009) stated unequivocally that research agenda is operationalized through the usage of questions to provide practicable solutions to the disquiets raised within the context of the research problem. To guide the exploration of the concerns highlighted by the problem statement, the following questions have been formulated:

- i. What accidents occur most on construction sites?
- ii. What are the various job stressors that affect workers on construction sites?
- iii. What is the impact of work place stress on the occurrence of accident on construction sites?

#### **1.4 AIM AND OBJECTIVES OF THE RESEARCH**

# 1.4.1 Aim of the study

The aim of the research is to investigate the impact of stress on the occurrence of accidents on construction sites in Ghana.

# 1.4.2 Specific Objectives

In addressing the above aim of the study, the following specific objectives have been articulated:

- i. To identify the accidents that occur on various construction sites in Ghana;
- ii. To identify the various job stressors that affect workers on construction sites in

Ghana; iii. To assess the impact of stress experienced by workers on the occurrence of accidents on construction sites.

#### **1.5 RESEARCH METHODOLOGY**

After successful identification of the specific objectives, it was essential to choose an appropriate methodology for the study. The methodology should be one which will solve the research problem and provide a solution to the research questions. Extensive theoretical and empirical literature review was conducted to help provide a thorough understanding of stress concepts, its effects on construction workers and how they impel the occurrence of accidents on construction sites. In terms of philosophy, the research leans towards the positivist appraoch to research. This is because, the efects of stress in the construction indusry is a matter of reality and hence research will be focused on a larger sample. Quantitative methods of research were adopted to establish the relationship between stress and its influence in the causation of accidents on construction sites in Ghana. . In using the quantitative approach, stress assessment was conducted by way of giving out structured survey questionnairs. In addition, the Structural Equation Model (SEM) was used as an analytical tool to ferrent out the relationship that exists between the variables (stress and accidents) from the data collected and also determine the influence stress has on accidents. Correlation analysis was also performed on the raw data. This showed a remarkable correlation between the various forms of stressors and their impact on the workers. The result was then interpreted and discussed along with the literature reviewed.

# **1.6 SIGNIFICANCE OF THE RESEARCH**

Developing countries such as Ghana are the countries with the high rate of accidents on their construction sites. As such, this study is of significance to the construction industry as a whole. Previous research into work stress has fixated on the experiences of workers in developed countries with little work being done in Ghana. The research will provide an insight into the

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interrelationship between stresses, burnout and safety performance and their impact on the occurrence of accidents on construction sites. From an organizational perspective, the study will highlight on the relevance of understanding the antecedents that form the basis for workplace stress, especially with the diversity that exist within the working population. This will act as a guide to straighten management on how to manage safety performance on their sites. These findings will form the basis of recommendations that will provide a thorough understanding to stakeholders in the construction industry to better manage and control the occurrence of accidents on their construction sites.

## **1.7 SCOPE OF THE RESEARCH**

Stress in general is an expansive topic, considering the fact that there exist several factors which are also interrelated. For instance, Leung *et al.* (2011) investigated the relationship between stress, job stressors, accidents and safety behaviors. Other researchers also focused on the various sources of workplace stress. However, this research focused on how all these stress affect construction workers and the role it plays in causing accidents on construction site. The motivation to center the research on the impact of job stress is driven by the fact that accidents have become very rampant on our construction sites in Ghana and previous studies conducted in developed countries have also shown stress to be a cogent factor in the up rise of accidents on construction sites. It is for this reason that the research was directed to cover the impact of stress on the workers. In terms of construction professionals, the scope of the study included; artisans, masons, laborers, and all persons directly involved in the physical construction work. The study was directed to one major region in Ghana, which is the Ashanti region. Most of the data was collected from workers on construction projects currently going on at KNUST.

# **1.8 ORGANIZATION OF THE STUDY**

This study is divided into five (5) independent but interrelated chapters. Chapter one deals with the general introduction and background to the research. The problem statement has been outlined and the need for the research justified. The research aim, objectives, and scope have also been presented, and the research questions formulated. The review of theoretical and empirical literature on stress and accidents was dealt with in chapter two. Chapter three focused on the research methodological approach used for the study and the data collection. Chapter four concentrates on the empirical analysis and interpretation of the data collected. Chapter five gives a final summary of the research results, avenues for further research, recommendations and limitations of the study. Below is the conceptual framework of the thesis organization.





Figure 1.1: Flow diagram of research process

# **1.9 CHAPTER SUMMARY**

This chapter provides the background of the study by addressing issues pertaining to stress and their involvement in causing construction site accidents. The deductive approach of research and quantitative methods were also employed. The research was limited to registered construction companies currently operating on KNUST campus. The study consists of 5 related but independent sections.

#### **CHAPTER TWO**

#### LITERATURE REVIEW

### **2.1 INTRODUCTION**

In the conduct of this literature review, several research and literature relating to the problem statement and research questions were all reviewed. A map was then drawn to show the relevant content in the literature reviewed. Figure two shows a review map depicting all the major titles that were covered in the literature review.

The construction industry has witnessed remarkable transformation across the world over these few years. Advancement of the economy, client preferences and technological improvement, improved and modified building procedures, increased pace of delivery and a tremendous upsurge in productivity have accounted for the great demand for construction products (Ibem *et al.*, 2011). Continuous modification of construction process, pace and complexity of work and the rise in the request for higher productivity has become a characteristic of the construction industry (Ibem *et al.*, 2011). This, according to Wahab (2010) has charged the working environment on several construction sites. The tight working schedules and complex nature of construction activities, amongst others has collectively made the construction work psychologically and emotionally demanding and extremely

#### stressful.

The construction industry is considered to be a highly risked industry with several accidents occurring. This is as a result of the limited time constraints that construction workers have to work with (Rahim *et al.*, 2008). Accidents are very costly to all stakeholders involved in the project and hence much effort should be made to identify its cause and possible ways of handling them.



Figure 2.1: Literature review map showing areas of interest.

Source: Selye (1936), Bashir (2010), Ibem et al. (2011), Raven et al (1998), Leung et al (2010), Kheni *et al* (2008), Idris et al. (2013), Abdelhamid & Everette (2000), Petersen (1971).





#### **2.2 CONCEPTUALIZING STRESS**

The concept of stress has widely been examined in the western world. Substantial research has been conducted on conceptualizing stress and stress models. Regardless of these numerous works, the definition of stress varies slightly in context.

# 2.2.1 Stress

A Canadian physiologist, Hans Selye in 1936, first introduced the term "stress". He explained stress to be a biological response that living organisms" exhibit when affected by environmental stimulus which has an effect on the individual"s performance (Selye, 1936).

Drawing from Selye"s ideas, Bashir (2010) agreed with Martino and Musri (2001) that stress has a positive effect on employees of any organization but up to a certain tolerable limit. The preceding ideas tend to suggest that stress is an unavoidable result of modern living and does not always yield a negative result as long as it is within a bearable level.

Logan and Ganster (2005) opined that stress is an undesirable reaction people exhibit when they are faced with severe pressures or other demands placed upon them. The Health and Safety Executive (HSE) defines stress as the 'adverse reaction people exhibit as a result of undue pressure or other types of burdens placed on them'.

In addressing the different context of stress, Health and Safety Executive UK in another report defined stress to be a situation which occurs when an individual is pressured, or the responsibilities placed on him are bigger than he can handle. The continual existence of these pressures may cause mental, physical or behavior problems to the individual (Health & Safety Executive, 2007). In a similar manner, Leung *et al.* (2012) perceived job stress and burnout to be two separate constructs. According to him, job stress is a temporary process requiring immediate adjustments that are commonly associated with mental and physical symptoms. Burnout, also, is the result of protracted job stress. These different definitions shows that stress is a multidimensional concept. Yao *et al.* (2014) quoted Lazarus" transactional model of stress and averred that stress did not reside only in the person or the environment, but rather in the interaction between the two entities.

### 2.2.2 Stress in Construction

Stress, due to its wider range of effects, is not bound to any specific profession (Ng *et al.*, 2005; Lath, 2010). According to Fimian *et al.* (2009) stress is the second most reported occupational health problem and the magnitude of reports is likely to increase over the coming years. Construction work is however noted to be a very stressful profession aside mining and police work (Statt, 1994; Ibem *et al.*, 2011). According to Campbell (2006) construction workers in the UK were gradually viewing their work as being stressful. The results from his research showed most of the respondents (68.2%) to be suffering from stress, anxiety or depression as resulting from working in the construction industry. Work stress can be stated as the effects suffered by an individual due to the working environment from which he feels unsecured, Bashir, (2010). Ibem *et al.* (2011) concluded in his research that work stress is considered as a major threat to the growth of the construction industry.

Investigation has proved that work stress and burnout occurs for several reasons. Table 2.1 demonstrates some of the reasons why work stress occurs in the construction industry.

RESEARCHER	REASON
1	Construction personnel are most at times expected to consider
Leung et al. (2012)	production ahead of their own personal safety.
LaDou (2003)	Lack of legal framework in occupational health and safety in developing countries.
Hughes and Ferret (2007)	Poor communication between management and the workforce in an organization.

Table 2.1 Reasons why work stress occurs

HSE (2001)	Frequent pressures with minimum or no time to recover.	
Poon <i>et al.</i> (2013)	High level of work demand.	
Ibem <i>et al.</i> (2011)	Tight budgets and ambitious deadlines.	

Source: Leung et al. (2012), LaDou (2003), Hughes and Ferret (2007), HSE (2001), Poon et al. (2013), Ibem et al. (2011).

Construction workers often express their discomfort through work stress when they feel they are not treated well. Lath (2010) cited Brown"s (2001) occupational perspective of stress as the physical and emotional reactions that occur when workers identify an inequity between their workload and their ability to meet such needs. In other words, stress is an undesirable physical and emotional reaction that occurs due to inequity in job demands and workers capability. It can therefore be concluded that work stress occurs as a result of the activities carried out at the workplace.

Loosemore and Waters (2004) conducted a study to determine how stress affects males and females in the construction industry. They found out that male workers in the construction industry suffer more stress in these areas; on site risk taking, disciplinary matters and firing and career advancement while their female counterparts get stressed out due to opportunities for personal progression, rate of wage, measure up to new designs and accumulative effect of minor tasks. Work Related Stress is stress caused by work. It basically refers to a person"s perception of his work environment in a manner that goes beyond his coping limits.

Bowen *et al.* (2013) wrote that construction is a very risky industry for occupational stress. Construction projects are characterized by longer working hours and dynamic activities which has caused an elevation in its stressful nature (Lingard *et al.*, 2010).

## 2.3 OCCUPATIONAL STRESS MODELS

Several researchers from different fields (medicine, clinical psychology, engineering psychology etc.) have delved into modelling stress and its effects on workers. There exist several different models of occupational stress with varying popularity and empirical support. Stress is classified into major and minor models. Raven *et al.* (1998) outlined the key stress models in his study and they compromised:

- The person-environment fit model
- The demand-control-support model
- Macro/micro Stress Models

#### 2.3.1 The Person-Environment fit model

Earlier researchers such as Lewin (1951) conducted investigations to determine how individuals relate to their environment. He observed in his study that, most individual"s personal characteristics interacted with their immediate work environment. This interaction sometimes caused strain, and consequent behavioral and health problems. This concept was developed into the Person-Environment fit model (French *et al.*, 1982) which proposes that the interaction between a person and his work environment is key in influencing their health. Melia and Becerril (2007) opined that stress mostly occurs as a result of the inaptness between the individual and the ambient environment. This model comprises the objective and subjective variables and their interaction in the environment or with a person. Employees" attitudes, skills, abilities and resources should match their specific job demands, and the environmental conditions of the site in order to maintain good health. Any changes in these purviews can cause serious problems, and the greater the nonconformity between the person and their environment, the greater the strain, as demands exceed the individual"s ability to contain those demands (Sonnentag *et al.*, 2003). Individuals most at times exhibit certain defense mechanisms, such as denial, reappraisal of needs, and coping, as a means of reducing subjective

misfit (Buunk *et al.*, 1998). Cox and Mackay (1979) opined that stress is a highly individual phenomenon which exists due to a person''s interaction between his environment and himself. They noted that stress arises on account of the disparity between the person''s perception of the demand allotted to him and his ability to actually cope with those demands.

Lazarus (1991) states that the Person-Environment fit model is a more developed model, but the concept is treated as static, emphasizing on the established relationship between persons and their environment rather than the varying interaction in the work environments.

## 2.3.2 Demand-Control-Support Model

The Demand-Control-Support Model developed by Karasek in 1979 is the widely used method to understanding stress and perhaps the most influential model for addressing work place stress (Kompier *et al.*, 2000). It emphasizes on how a person relates the job demands placed on him to his ability to actually execute the tasks placed on him. The DemandControl-Support Model, according to Mark & Smith (2008) showed fatigue, depression, cardiovascular disease and mortality as effects suffered by individuals exposed to higher job demands with lower job control. He also stated that although individuals are faced with higher job demands, they will have lower levels of illness if they have matching high level of job control.

In principle, this model proposes that a mishmash of psychological job demands, decision making tools, and support from workers can help examine the various aftereffects of stress (Karasek and Theorell, 1990; Mark & Smith 2008). This model suggests that the synergy between workers and their job demands at different levels will result in different levels of strains as follows (Karasek, 1979; Mark & Smith 2008):

- High Job Demand/High Decision Space: Normal Level of Strain
- High Job Demand/Low Decision Space: Highest Level of Strain
- Low Job Demand/High Decision Space: Lowest Level of Strain

• Low Job Demand/Low Decision Space: Low Level of Strain

With regards to stress factors in the construction industry, Kenneth (2005) noted that job stress is the manifestation of factors that deleteriously erode values from the project, and makes it difficult to attain the set goals. Work overloads, working long hours and role ambiguity amongst others are perceived to be dominating antecedents of stress amongst construction professionals (Sutherland and Davidson, 1989; Mark & Smith 2008). The Demand-Support-Control Model as stated Kompier *et al.* (2000) is a popular model and has a good prognostic validity. It is however deficient in capturing the complexities of the stress process, and hence requires be used collectively with other models for better results (Mark & Smith, 2008)

# 2.3.3 Macro/micro Stress Models

Kanner *et al.* (1981) first introduced the micro/macro stress models. The study analyzes two dissimilar methods of stress measurement: Stress measured through micro-stressors (e.g. daily hassles) and macro-stressors (e.g. major life events). Findings from Kenner *et al.* (1981) proved the following:

- Unending daily hassles (micro-stressors) give direct insights on the individuals stress events than the macro-stressors.
- Macro-stressors comprising the major stress events had a minimal effect on psychological symptoms as associated to the effects accrued by the unending daily hassles.

In conclusion, micro-stressors exhibit the potential of independently affecting psychological symptoms without any involvement of major life events.

To use this model in the construction industry, proper attention should be given to the extension of the model. Using it in the construction industry would mean that, the minor hassles that are inevitably present as part of the work environment should be considered when developing coping methods for occupational stress and strain symptoms.

#### 2.4 OVERVIEW OF OCCUPATIONAL STRESSORS

Occupational stressors are the several activities related to a person's work or work environment that causes the body to be stressed (HSE, 2001). These stressors could be related to the management style, the work packages or activities been carried out or the work environment.

# **2.4.1 Organizational Stressors**

These stressors mostly emerge from reasons associated with the particular organization or profession. Organizational stressors are mostly associated to the management style of the organization. It also defines the antecedents that intensifies the difficulty and intricacy of workers executing their duties on site. Examples include, low salary and compensation, minimum or no training in safety, poor communication and information dissemination amongst others.

# 2.4.2 Job Related Stressors

Due to the complexity and robust nature of construction activities, they sometimes become initiators of the stress process (Thompson *et al.*, 2006). Examples of job related stressors include work load, ambiguous task completion time, task complexity, conflict in responsibilities specified to workers and workers been under skilled for work. Role conflict occurs when conflicting job demands or responsibilities placed on the worker. Work overload was noted to be the highest and most common job stressor in Moon and Maxwell (2004) research that explored the sources and aftereffects of stress amongst correction officers.

#### **2.4.2 Work Environment Stressors**

As the name implies, are features of the place of work which are pertinent to the environment. These environmental stressors include excessive noise levels, poor lighting (Wong *et al.*, 2006), inadequate ventilation and working in dangerous environment (inaptly planned site). Stress levels were noted to exhibit an inversely proportional relation to a measure of the physical work environment. That is, stress levels increase more and more as the physical work environment gets poorer (Goldenhar *et. al.*, 2003; Leung *et. al.*, 2008; 2010).

#### 2.5 CAUSES AND EFFECTS OF STRESS

Idris *et al.* (2010) noted that, the cause, effect and the way people relate to job stress is different. Several factors influence the way people perceive and react to job stress.

#### 2.5.1 Causes of Workplace Stress

Campbell (2006) conducted a survey to categorize the major causes of occupational stress within the construction industry. The research was aimed at examining different areas within the construction industry, including the ambient work environment, the organization itself, the individual's responsibility within the organization and other construction specific potential stressors such as construction site safety, etc. According to HSE (2001) work related subjects such as workload, control over work, support systems, the individual's responsibility within the organization and organizational change management are all contributing factors towards the occurrence of stress in construction workers. Kokt and Ramarumo (2015) agreed with Campbell (2006) that demanding nature of work in most industries render job stress and burnout, an inevitable and persisting challenge for the industry. Employees that are constantly open to a challenging work environment may show signs of increased levels of job stress and burnout or even leave the industry entirely. Employees are often faced with a lot of stress and this is due to many precursors of stress such as work overload, role ambiguity, role conflict,

responsibility for people, improper communication channels, keeping up with rapid technological changes (Bashir, 2010).

Bashir (2010) stated some eleven forces to be the antecedents of stress by reviewing several researches (work overload, role ambiguity, role conflict, responsibility for people, participation, lack of feedback, keeping up with technological innovation, being in an advanced role, career development, organizational structure and recent episodic events).

Work overload: work that is beyond one's capability (Margolis *et al.*, 1974; Bashir, 2010) Role Ambiguity : role given with little or no information on authorities and duties to perform the role (Kahn *et al.*, 1964; French *et al.*, 1982; Bashir, 2010), Role Conflict: supervisors or subordinates place contradictory demands on the worker (Caplan and Jones, 1975; Caplan *et al.*, 1975; Beehr *et al.*, 2006; Bashir, 2010) Responsibility for people: accountability for people, well-being of workers, job security, and professional progression (French *et al.*, 1982; Pincherle, 1972; Bashir, 2010) Participation: extent to which one is involved in the decision making process relevant to one's job (Kasl, 1978; Margolis *et al.*, 1974; Bashir, 2010). Lack of feedback: lack of information about job performance (Bashir, 2010) Keeping up with rapid technological advancement: keeping up with modern technological trends (Ginzburg, 1967; Bashir, 2010) Being in an innovative role: having to bring about change in the organization (Kahn *et al.*, 1964; Bashir, 2010). Career development: Impact of status dissimilarity, lack of job security, let down ambition (Bashir, 2010)

Poon *et al.* (2013) agreed with Ibem *et al.* (2011) that construction personnel"s who reported to be stressed were the ones who have direct relationship with the construction operations and are responsible for any reworks that might occur. Meliá and Becerril (2007) stated bureaucratic leadership behavior to be a major source of workplace stress.

#### 2.5.2 Effects of Workplace Stress

Stress is noted to be a major contributing factor to poor safety performance at the workplace (Wahab, 2010; Ibem *et al.*, 2011; Leung *et al.*, 2012). Though the individuals are affected by work stress, job performance is also significantly affected when employees get stressed out.

According to Poon *et al.* (2013), protracted aftereffects of job stress might cause job burnout, which could induce accidents on job sites and affect the organization in the form of lost working days and an increment in the total project cost. Poon *et al.* (2013) found that prolonged stress produces job burnout, which will either have a direct effect, no effect at all or an indirect effect through some intermediaries, based on the level of involvement of the worker. It was noted in their research that personnel"s who normally experience job burnout, become susceptible to safety provisions. Job burnout is stated by Nahrgang *et al.* (2011) to causes lack of focus and concentration endangering employees on job sites.

Ademola (2005) and Melinda *et al.* (2010) agreed that the aftereffects of stress can be placed under four major categories which are; mental (how the mind operates), physical (how the body works), behavioral (the things we do), cognitive (the way we think and concentrate). Strains that occur to individuals as a result of unbearable stress may exhibit certain symptoms such as; negative emotions, physiological fatigue, insomnia, interpersonal hostility or aggressiveness in communication. In addition, stress also breeds behavioral responses which includes lateness, absenteeism and keeping to one''s self (Leung *et al.*, 2008).

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# 2.6 ACCIDENTS IN THE CONSTRUCTION INDUSTRY

Accidents at workplace can be defined in several ways based on the perspective in which it is used. The term incident is used, as a broader term incorporating an accident as a specific type of incident (OSHwiki, 2016). According to Heinrich (1931) accident is an unintended and uncontrolled event whereby the activities of an object, person or substance results in personal

injury. Kheni *et al.* (2008) opined that developed countries have shown commitment to dealing with stress and its effects. This is aimed at achieving a reduction in accident occurrence in the industrial settings. It is rather unfortunate for developing countries like

Ghana, since little effort is being made to solve this problem. Kheni *et al.* (2008) agreed with Hämäläinen *et al.* (2006) that accident rates in developing economies are high and still on the rise owing to the pace of industrialization in such countries.

The construction industry faces various occupational health issues as compared to other industries because of the robust nature of activities that are carried out. The institutional and legal governance frameworks in developing countries do not provide strict occupational health and safety rules and regulations (LaDou, 2003). He also noted that most of these contractors are SME"s operating within the domestic markets. This makes the law enforcement process very difficult. According to OHSAS 18001 standard, an accident is denoted to be a work-related event that cause the individual to suffer injury, ill health or even death. A near-miss is considered to be an incident where no injury or illness occurs whiles accident relate to the opposite situation of a near-miss. Therefore, an incident can either be an accident or a near-miss. OSHwiki (2016) listed seven accidents or hazards to be the most frequently occurring types of injuries on construction sites. The accidents included; falls from height, struck by falling objects, electric shock, strenuous movement injury, trench collapse, stepping on objects and exposure to extreme temperatures. Rahim *et al.* (2008) in his investigation into the causes of accidents at construction sites concluded that falls from height and stepping on sharp objects are the main causes of accident in the Malaysian Construction Industry.

The construction industry still encounters several casualties irrespective of the efforts put in place to prevent occupational accidents. Sousa and Teixeira (2004) noted the construction industry to be an extremely hazardous industry due to its operations.

The National Labour Department in 2015 provided statistics that proved that, construction accidents have increased steadily in Ghana over the previous years. It can be noted from the table that, accident occurrence rose from eight (8) in 2004 to twenty-eight (28) in 2009.

YEAR	Number of accidents per year (%)	Index
2004	8	100
2005	21	262.5
2006	29	362.5
2007	20	250
2008	30	375
2009	28	350

 Table 2.2 Record of accident occurrence per year

**Source: National Labour Department (2015)** 

#### 2.6.1 Accident Causation Models

Anne & Ma (2006) stated in their study that accidents occurring on construction sites were mainly instigated by two factors. These include physical (physical and psychological capability) and job factors (supervision, design, tools and equipment etc.).

Accident causation models are models designed to provide hypothetical basis for explaining the core source of accidents that transpire at various work places. Statistical data (the workplace, occurrence, victims, causes, etc.) is collected on accidents that occur on construction sites. They provide a basis for preventing any of such accidents in the future.

# 2.6.1.1 Heinrich Domino Theory

Heinrich in 1930, first researched on this theory which deliberated on accident causation theory. The theory delved into the interaction between man and machine, the acts, the management role in accident prevention, the costs of accident, and the effect of safety on efficiency. Abdelhamid and Everett (2000) cited Heinrich''s model as a theory of causation that is composed of five dominoes namely ancestry and social environment, fault of a person, unsafe acts and condition, accident, and injury. The dominoes model proposed that through certain inherited traits, people may commit unsafe acts or cause the presence of perfunctory or physical hazards that may result in accidents (Abdelhamid and Everett, 2000). The theory was engrossed on two main things, the fundamental reason that brought about the accident. The second aspect espied on the action of management in preventing the accident from happening (e.g. by providing safety facilities on the job site). Heinrich deduced from accident reports that he gathered that, 88 percent of accidents are largely because of the unsafe act of workers, whiles unsafe conditions on the job site caused 10 percent of accidents with the remaining 2 percent associated with natural disasters.

# 2.6.1.2 Multiple Causation Model

Petersen (1971) formulated a theory which slightly differed from the domino theory that influenced many researchers during Heinrich time. This model was enthused by his believe that accident occurrence can be attributed to several contributing factors. Causes and subcauses was employed as the main bases in an accident scenario. Abdelhamid and Everett (2000) stated that by using multiple causation model, the surrounding factors to the accident would be discovered.

Taking a fall from a scaffold accident as an example, the question should be "why was the defective scaffold not found during checks, why the supervisor allowed it to be used, whether the injured worker knew that the scaffold was defected but still used it". The questions are not directed to the accident victim only, but to management and all stakeholders who relate to the accident. The answers obtained is then used to extract the root cause(s) of the accident and also to suggest preventive measures. Abdelhamid and Everett (2000) stated that multiple causation

model could be used to detect the fundamental causes of accidents. Petersen concluded that two major events lead to an accident occurrence, namely; perilous act and perilous condition. He deduced that accidents are instigated by multiple factors which contribute to both perilous act and create perilous condition. Unlike theory of domino, there are causes and sub-causes to every accident that occurs.

#### 2.6.1.3 Human Error Theories

This approach identifies the individual as the main causative factor of an accident. This approach as mentioned by Abdelhamid and Everett (2000), studies the predisposition of humans to make error whiles executing their activities under various conditions and states. He noted that the culpability mostly falls on unsafe human characteristics merely. But this theory does not blame the workers as the only problem for accident occurrence, but considers other factors such as design of the work site amongst other things (Abdelhamid and Everett, 2000). In general, the overall objective of human error theory is to construct a better design workplace, tasks, and tools that suit the human limitation.

According to Abdelhamid and Everett (2000) other theories that relate to the human error theory (behavior model, human factor model and Ferrel theory) have also been appraised by other authors. Reason (2000) noted that the human error factor can be explained in several approaches (person approach and system approach). Most of these theories address the individual as the main problem that instigates an accident such as the permanent characteristic of a human, the combination of extreme environment and overload of human capability and conditions that make humans tend to commit errors (Abdelhamid and Everett, 2000).

#### 2.7 RELATIONSHIP BETWEEN STRESS AND ACCIDENT OCCURRENCE

Sorensen *et al.* (2014) stated in their research that the consequences of injuries in construction are often severe, and in 2010 construction had the highest number of fatal occupational injuries

of all U.S. industries. Studies have shown ample relationship between construction injuries and stress on the workers. According to Sorensen *et al.* (2014) stress can contribute to accidents by causing construction workers to: sleep badly, drink excessively, feel depressed, feel anxious, feel nervous, feel angry and reckless, become distracted, errors in judgment, miscarry normal activities that require hand-eye or foot-eye coordination etc.

According to Gyekye (2006) for example, workers" perceptions of high job demands and work pressure tend to be associated with an increased tendency to employ unsafe acts when carrying out construction operations, which in turn will increase accident occurrence

(Hoffman and Stetzer, 1996; Gyekye, 2006).

A proposition made by Goldenhar *et al.* (2003) showed the correlation between job stressors and accident occurrence on construction sites. It was concluded in the study that, workers with high levels of psychological symptoms or effects are more vulnerable to near-miss occurrence while higher levels of physical symptoms indicated a higher risk of suffering an accident. An illustration of the Goldenhar *et al.* (2003) is indicated in figure 2.3.



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Direct relationship between independent and dependent variables

--> Indirect relationship between independent and dependent variables through intermediate symptoms

Figure 2.3: Relationship between stressor-injury/near-misses and days lost (adapted from Goldenhar *et al.*, 2003).

# **2.8 CHAPTER SUMMARY**

This chapter of the study focused on the review of relatable literature in the area of Stress and Stress management within the Construction industry in Ghana. The chapter showed a clear relationship between stress and the accidents that occur on the construction sites. Review of literature also revealed the gap in the existing literature. Existing studies only concentrated on the relationship that exist between stress and accidents without actually considering the magnitude of the various stressors on the individual accidents.

# CHAPTER THREE

# **RESEARCH METHODOLOGY**

## **3.1 INTRODUCTION**

Scientific research encompasses all processes used in the collection of information and data for the purpose of making decisions whiles research methodology on the other hand involves all the approaches or procedures used to collect the data. It may include previously published research, interviews, surveys etc. reliant on the type of research being conducted.

This chapter probes into the different methodological approaches adopted for this study and widens the methodology highlighted in chapter one. Meticulous enlightenments of the specific research strategies are also examined, highlighting the methods used to collect, analyze and interpret the data.

# **3.2 METHODOLOGICAL PARADIGM OF THE RESEARCH**

Paradigms as stated by Pollack (2007) incorporates the shared assumptions, values, abilities, assumptions and concepts that represent a specific group of people. According to Smyth and Morris (2007), paradigms are vital to the research techniques to be used and also influences the research approach to be adopted. The positivistic approach is chosen for this study. Positivism
is a social science research paradigm which assumes that social phenomena are subject to quantitative reasoning. The choice is appropriate for this study because it investigates the interrelationship between two variables (job stressors and their impact on accident occurrence). The approach seeks to identify, measure and evaluate the Stress phenomena and provide cogent clarification on it. The researcher is detached from the subject of investigation in positivism. The construction industry is made up of different categories of workers, thus; architects, quantity surveyors, construction managers, masons, carpenters, artisans etc. It is difficult for a researcher to be involved or participate in all the deliberations regarding the research.

#### **3.3 METHOD OF SCIENTIFIC INQUIRY**

Regarding this research, the deductive approach to research inquiry is adopted. The choice of deductive reasoning is founded on the inferences of the paradigms. The paradigms constitute positivism, quantitative techniques, and attributes of objectivity. The quest to position the study in a deductive reasoning originates from the fact that a general perspective is investigated so as to arrive at specific facts (impact) on stress and accident. Deductive reasoning can be used to formulate and subsequently test theories established (Krauss, 2005). It is also imperative to consider the methods adopted by other researchers and this can only be attained through deductive reasoning. The quantitative method of research enquiry was espoused for the study. The study is mainly focused on the determining the impact of stress which can only be realized by collecting numerical data. The quantitative method was chosen because numerical data will be collected and analyzed statistically to determine the correlations between the variables identified.

#### **3.4 RESEARCH STRATERGY AND DESIGN**

According to Burns and Grove (2003) research design is fundamental to conducting the study since it offers the researcher control over elements that could impede the validity of the results.

It is imperious to carry out a research design so as to acquire enough information to critically answer the research questions (Creswell, 2009). Explanatory research design was employed for the study since it reveals the interrelationship that exist between facets of a phenomenon. The preliminary stages focused on identifying the aim, research problem and the objectives of the research. An extensive literature study was conducted to conceptualize stress theories and accidents. A study focusing on the construction industry with its stakeholders being humans can effectively be conducted using surveys. Questionnaires were used to collect data from respondents. This method helps to make better deductive conclusions. The questionnaires were administered to practitioners in the construction industry with specific interest in the people directly involved in the site activities such as mason, laborers, carpenters equipment operators, painters, ironworkers etc. Various construction sites were visited and workers given questionnaires to answer to determine how stress affects them. The final step was to analyze the results and give constructive insights into the results obtained and finally provide conclusions and recommendations.

#### **3.5 SURVEY QUESTIONNAIRE**

Questionnaires are data assemblage tools that are developed by the researcher to facilitate the collection of data, simply by asking questions. Questionnaires can be printed or presented in several electronic forms. Questionnaires must be clear and designed to attract responses which are related to the subject matter.

#### **3.5.1 Structure and Design of Questionnaire**

According to Collins & Hussey (2009), questionnaires are sets of well-structured questions used to obtain data from respondents in a scientific study. Questions asked on a questionnaire can be open or closed (Saunders *et al.*, 2003). The questionnaire was prepared to expatiate on the objectives set for the study. Concentrated review of literature on the subject matter revealed

several factors relating to the subject matter. These factors were incorporated in the structure of the questionnaire. The questionnaire was made up of five (5) sections; refer to **APPENDIX 1.** 

**Section A** which formed the first part of the questionnaire was designed to inquire about the respondents" personal information. This section was used to determine if any of the variables inquired about has any effect on the research findings. Construction related studies, as noted by Hallowell & Gambatese (2009) requires respondents who have attained some specific years of experience in their field of work and a particular level of education.

Section B formed the second part of the questionnaire. This section required respondents to rate certain job related stressors identified from literature as to how they (respondents) are affected by these stressors in carrying out their duties on construction sites. These formed the independent variables used in the study. The impact of the stressors was measured using a likert scale of 1 - 5 where 1 = Not Severe, 2 = Less Severe, 3 = Moderately Severe, 4 = Severe and 5 = Very Severe as adopted from Campbell (2006) research in determining occupational stress in the construction industry. These are shown in Table 3.1.

OS	ORGANIZATIONAL STRESSORS
OS1	Inadequate training in safety
OS2	Low salary
OS3	Employers focus on productivity and ignore their employees safety
OS4	Poor communication and information dissemination
OS5	Insufficient staffing
OS6	Poor top management support
JDS	JOB DEMAN <mark>D STRESSORS</mark>
JDS1	Work load
JDS2	Work schedule
JDS3	Role conflict
JDS4	Role vagueness
JDS5	Variations in the scope of work
JDS6	Insufficiently skilled for work

Table 3.1: Job Related Stressors affecting construction workers

WES	WORK ENVIRONMENT STRESSORS
WES1	Poor lighting
WES2	Inadequate ventilation
WES3	Noise levels
WES4	Working in dangerous environment
D 11 D	

Section C required respondents to indicate the effects of job stress they experience. These effects were derivative from literature and noted to be the prevailing effects expected to be experienced by a person affected by stress. The effects were adopted from Melinda *et al.* (2010). The effects were measured on a 5 point likert scale (1 = Not Probable, 2 = Somewhat Improbable, 3 =Neutral, 4 = Somewhat Probable and 5 = Very Probable).

EO	EMOTIONAL OUTCOME
EO1	Nervousness and Anxiety
EO2	Frustration
EO3	Lack of energy and low morale
EO4	Anger
EO5	Isolation
EO6	Lack of confidence
РО	PHYSICAL OUTCOME
PO1	Migraine and Headaches
PO2	Back pain
PO3	Sleep disturbances
PO4	Skin problems
PO5	Diseases: high blood pressure, stomach disorders and others
BO	BEHAVIORAL OUTCOME
BO1	Aggressiveness
BO2	Drug and alcohol use
BO3	Argumentative
BO4	Repetitive absenteeism
BO5	Procrastination or neglecting responsibilities
СО	COGNITIVE (MENTAL) OUTCOME
CO1	Inability to make decision
CO2	Inability to concentrate
CO3	Poor working standards
CO4	Poor judgement
В	BURNOUT

 Table 3.2: Effects of Jobstress and Burnout

B1	Low job satisfaction
B2	Low organizational commitment
B3	Seeking for better job
B4	Low personal accomplishment

Section D of the questionnaire demanded respondents to indicate how often the experience the indicated accidents and injury. Eight (8) accidents were identified from literature and respondents were asked to rank these accidents by stating how frequent they have suffered any of these accidents in the past 12 months. The frequency of these accidents were assessed on a 5 point likert scale (1 = Not Frequent, 2 = Less Frequent, 3 = Moderately Frequent, 4 = Frequent and 5 = Very Frequent).

1 abic 5.5. A	certaints on construction sites
ACC	ACCIDENTS ON CONSTRUCTION SITES
ACC1	Falls from height
ACC2	Vehicular crushes
ACC3	Electrocution
ACC4	Being struck by falling objects
ACC5	Strenuous movement injury
ACC6	Stepping on sharp objects
ACC7	Exposure or contact with extreme temperatures

Section E, which represents the last section of the questionnaire required respondents to indicate the extent to which each of the stressors affect each of the seven accidents. A 5 point likert scale was adopted, where 1 = Very Low, 2 = Low, 3 = Medium, 4 = High and 5 = Very High.

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#### **3.6 THE STUDY POPULATION**

To carry out any research work, it is imperative to first of all identify your study population. According to Explorable.com (2009), research population represents the greater collection of individuals or objects who represent the main focus in any scientific study. Individuals or persons in a population are usually characterized by similar features. With regards to construction companies, construction sites of companies currently working for KNUST formed the target population. This makes the population unidentified because these companies have subcontracted various sections of their project to several companies and individuals. Hence, it becomes very difficult to actually determine the total number of persons working on these sites. The subject of the study comprised workers who are involved in the direct construction work. These persons are listed in **Table 4.1**.

#### **3.7 SAMPLING TECHNIQUES AND SAMPLE SIZE**

Sampling involves the identification and selection of a fraction of the entire population and collecting information for a research. The selected sample must be a depiction of the general population. The Purposive Sampling Technique was adopted. This is a non-probability sampling where part of the population is selected based on the researchers" criteria. The criteria are listed below:

Construction sites visited should belong to companies within the D1K1 – D4K4 category.

• Construction sites should be within KNUST campus and carrying out projects belonging to the university.

Companies employed to answer the questionnaire should have executed several projects
 and gained enough experience.

In order to carry out a substantial sampling, it is imperious to describe the sample size for the study. The sample size represents the actual size selected from the population to answer the questionnaire. The sample size chosen for this study was influenced by the analytical tool employed for the study. A minimum sample size of 200 is needed in order to effectively model using the Structural Equation Model (Bentler, 2005). According to Bentler (2005), a variable ratio of 5:1 is considered an appropriate sample size for a SEM model. With that in mind, the

48 observed variables required a sample size of 240 (see appendix 1). As such a total of 250 questionnaires were administered.

#### **3.8 DATA SOURCES**

Both primary and secondary data sources were employed in the research. Responses from the questionnaires gave first-hand information on the research topic. Construction workers were made to answer questionnaires which served as the main data for the study. Supplementary data were derived from the literature (books, journals, articles, thesis etc.) and other documents relation to the subject matter.

#### **3.9 DATA ANALYSIS AND STATISTICAL TOOLS**

Current trends in organizational stress research, as well as research on burnout and accidents use both descriptive statistics and inferential statistics (i.e. correlation and Structural Equation Model) in analyzing the data derived.

#### **3.9.1 Descriptive Statistics**

Descriptive analysis was used to estimate the central tendency of the response. The statistic used was mean score with standard deviation which was used to provide a summarized view of the data collected. Relative index was used in addition to rank the measurement items in relation to the others.

#### **3.9.2 Correlation Analysis**

Correlation analysis was conducted to examine the interrelationships between the job stressors and accident occurrence at the construction sites. Spearman correlation was used since the data was non-parametric in nature. Correlation coefficients and probability (significant) values were used to examine strength and significance levels of the relationship.

#### **3.9.3 Structural Equation Modeling**

Structural Equation Modeling (SEM) was used to measure the impact of the stress factor on the individual selected site accidents. Structural Equation Model was chosen due to its effectiveness in estimating direct and indirect assessment of more or few independent variables on one or multiple dependent variables (Bentler, 2005). Structural Equation Model in addition unveiled the distinction between the true variance and the error variance useful for model development and measurement of impact. Structural Equation Model has been noted to be a highly dependable approach for analysis due to its larger sized sample. Also, the choice of the SEM over Multiple Regression Analysis was by the fact that it is able to reveal causal relationships among multiple variables compared to multiple regression which is only very exploratory (Byrne, 2006; Bentler, 2005).

#### **3.10 CHAPTER SUMMARY**

This chapter focused on the methods which were adopted for the conduct of this research. Key considerations were given to the methodological paradigm of the research, method of scientific inquiry and reason, research strategy and design, sampling techniques and sample frame. Mean score ranking, Relative Importance Index and Structural Equation Model were employed as analytical tools for the study.



#### **CHAPTER FOUR**

#### DATA ANALYSIS AND DISCUSSION OF RESULTS

#### **4.1 INTRODUCTION**

The chapter focuses on the analysis of the data collected followed by a thorough discussion of the research results. Data was examined to identify, assess and determine the impact of stress on the various accidents that occur on construction sites in Ghana. A total of 250 questionnaires were administered. This sample size was appropriate for the study since the least required number of responses for Structural Equation Model (SEM) is 200. The quality or accuracy of any survey is largely reliant on the rate of response achieved (Biemer and Lyberg, 2003). As such, 81.6% response rate was achieved representing a total of 204 responses from all the 12 construction sites employed in the study.

The questionnaire was structured into five main sections and the generated data is presented as follows;

- Section A considers the demographic data of the respondents such as sex, age, job tittle and years of experience.
- Section B considers the job stressors that cause workers on construction sites to be affected by stress.
- Section C deals with the effects of job stress and burnout as experienced by the workers.
- Section D considers the various forms of accidents that occur on our construction sites.
- Section E, finally considers the impact of stress on the occurrence of accidents on our construction sites.

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#### 4.2 DEMOGRAHIC RELATIONSHIPS OF RESPONDENTS

This comprised a set of questions which seek to inquire about the personal information of the respondents. This information is vital to the research. Although it does not form part of the main study, it is imperious to evaluate for any effects on the research findings. The demographic data included: sex of the respondents, age, respondents profession and respondents'' years of experience.

#### 4.2.1 Respondents sex

American Psychological Association (2011) stated in their study that both men and women recognize the impact of stress on their health differently. Women are considered by many scholars to be more likely to be under stress. This was evident in Bowen *et al.* (2013) study on the nature of stress experienced by construction workers in South Africa. They concluded that female pros in the industry were more susceptive to experience work place stress than their male colleagues. As shown in Figure 4.1, 90% (184 respondents) of the respondents were male and the remaining 10% (20 respondents) were females. This implies the findings will mainly skew to the masculine perception of stress.



**Figure 4.1: Sex of respondents** 

Source: Field Study (2016)

#### 4.2.2 Respondents age

Figure 4.2 gives a graphical representation of the age distribution of the respondents. It was noted that most of the respondents fall between the ages of 18 to 30 years which represent the youth in Ghana (National Youth Authority, 2014). According to American Psychological Association (2011), millennials (persons with ages 18 to 33) are more likely to report the higher stress levels. This outcome is very relevant to the study since the millennials are the ones mostly affected and can give a proper account on the effects they experience.



#### **Figure 4.2: Age of Respondents**

Source: Field Study (2016)

#### 4.2.3 Respondents profession

It was important to determine the profession or job tittle of the respondents so as to help establish a relation to the job stress that mostly affects them on site. Greater part of the respondents were Laborers, which represents 27% and Mason, representing 20% of the total number of respondents. **Table 4.1** gives a distribution across occupations of the participants included in the survey.

Job title	Frequency	Percent
Carpenter	12	6%
Electrician	15	7%
Foreman	19	9%
Instrument technician	2	1%
Ironworker(steel erector)	10	5%
Laborer	55	27%
Heavy equipment operator(digger, excavator, etc)	11	5%
Mason	40	20%
Painter	11	5%
Plumber	4	2%
Safety officer	6	3%
Truck driver	9	4%
Welder	10	5%
Total	204	100%

|--|

Source: Field Study (2016)

#### 4.2.4 Years of experience in the Construction Industry

**Table 4.2** below shows the estimation result of the number of years respondents have been in the construction industry. Descriptive statistics (mean) was used for the measure because the data was scaled (where respondents were asked to provide period). It is noted from the table that the sample size (N) used for the descriptive analysis is 202 because two respondents did not give any information to that question. It was observed that, the mean number of years

respondents have been in the construction industry was 8.38 years. The standard deviation, 5.481 was highly which depicted the data deviated or move away from the mean. This made the mean number of years unrepresentative. From the result, it could be seen that the minimum and the maximum number of years respondents have been in the construction industry was 2 years and 25 years respectively. Further analysis was run to see the distribution of the age group for number of years. Respondents have been in the construction industry. This was done because the data was not normally distributed; but skewed.

N	202	
Mean	8.38	
Std. Deviation	5.481	
Minimum	2	1
Maximum	25	7

 Table 4.2: Respondents years of experience in construction industry

Source: Field Study, 2016

#### 4.3 JOB STRESSORS THAT CAUSES STRESS TO THE WORKERS

The second section of the questionnaire (Section B), which sought to identify the various job stressors that affect workers on construction sites in Ghana, was used to answer the second objective inscribed in chapter one. The stressors used to identify the causes of stress in the workers were all derived from literature (see Bashir, 2010; Leung *et al.*, 2012). Bashir (2010) noted some forces to be precursors of stress and categorized into organizational stressors, job demand stressors and work environment stressors. This was used to ferret out how the factors affect the workers on construction sites. **Table 4.3** below demonstrates the various stressors with their respective mean score, standard deviation, RII and overall ranking as well as the thematic ranking.



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#### Table 4.3: Job Related Stressors

Job Related Stressors	N	Mea n	Std. Deviation	RII (%)	Ranking	Overall Ranking
Organizational stressors	204	3.54	0.615	71		
Low salary	202	4.24	0.949	85		
					1st	2nd
Insufficient staffing	200	4.02	0.835	81	2nd	5th
Employers focus on productivity and ignore their employee's safety	202	3.52	0.780	70	3rd	8th
Poor communication and information dissemination	202	3.38	1.145	68	4th	10th
Poor top management support	200	3.20	0.926	64	5th	12th
Inadequate training in safety		3.13	1.208	63	бth	14th
	202	-	1 -	1		
Job demand stressors	204	3.74	0.791	75		
	202	1.20	1.012	00	4	1.
Work schedule (ambitious deadlines)	202	4.39	1.042	88	lst	1 st
Insufficiently skilled for work	200	4.10	0.940	82	2nd	4th
Work load (overload or under tasked)	202	3.87	1.196	77	3rd	6th
Role conflict	202	3.66	0.970	73	4th	7th
Variations in scope of work	202	3.44	1.184	69	5th	9th
Role vagueness	200	3.25	1.007	65	6th	11th
Work environment stressors	204	3.02	0.739	60		
Working in a demonstration prost	202	4.10	1.072	02	1 ~4	24
Poor lighting	202	4.12	1.072	82 64	1St 2nd	51U 12th
Poor lighting	202	5.16	1.559	04 51	2110 2.nd	1 JUI 1 541
Inadequate ventilation	202	2.55	1.154	51	3ra	15th
INOISE IEVEIS	202	2.33	1.038	47	4th	Ioth
		2	0			
WJSAN	EN	0	2			



Source: Field Study, 2016



#### Figure 4.3: Types of Job Stressors affecting workers

Source: Field Study (2016)

#### 4.3.1 Job demand stressors

It was noted that job demand stressors affected the workers more than organizational and work environmental stressors. The mean score for the sub construct; job demand stressors was 3.74 having relative stress index of 75 percent placed it the highest work related stressor affecting the workers. Under job demand stressors, the most affected measurement stress item observed was work schedule (ambitious deadlines) ranked first with index of 88 percent, which is highly significant. Ambitious or unrealistic deadlines was noted by Ibem *et al.* (2011) to be the major work related stressor affecting workers in the construction industry. Closely to job demanded stressors were insufficiently skilled for work with relative stress effect of 82 percent. Work load (overload or under tasked) and role conflict were the third and fourth stress causing factors with indices of the 77 percent and 73 percent respectively. Variations in the scope of work and roles vagueness were the last two stressors under job demand stressors ranked fifth and sixth. Their relative stress effect were 69 percent and 65 percent respectively.



#### Figure 4.4: Job Demand Stressors affecting workers

Source: Field Study (2016)

#### 4.3.2 Organizational stressors

The second type of stressors that was significant was organization stressors. It was rated with stress effect index of 71 percent showing it was significant. The most stressors under this group were low salary recording index of 85 percent. This meant workers perceiving their salary were low are mostly stressed at the construction site. Insufficient staffing was ranked second with stress index of 81 percent, highly significant effect. This stressor inversely correlated with workload; where there is insufficient staff available, workers are over tasked which eventually fueled their stress levels. Employers concentrate on productivity and ignoring their employees" safety significantly affect workers on construction site. It was ranked third with stress index of 70 percent. Poor communication and information, dissemination, poor top management support and inadequate training on safety were the fourth, fifth and sixth ranked stressors respectively. Their stress indices observed were 68 percent, and 63 percent respectively.



#### **Figure 4.5: Organizational Stressors affecting workers**

Source: Field Study (2016)

#### 4.3.3 Work environment stressors

The last type of stressors was work environment stressors rated overall stress index of 60 percent. It was observed to be affecting workers on construction site but not as high as the first two stressors; organization stressors and job demanded stressors. The most significant stressor under work environment stressors was working in a dangerous environment. The mean score rated was 4 and stress index was 82 percent showing it was highly significant stressor in construction site causing an up rise in the stress levels of the workers. The second work environment stressors was poor lighting with an index of 64 percent. Inadequate ventilation was next to poor lighting with stress index of 51 percent. The least stress observed was noise level stress, recording stress index of 47 percent.



#### Figure 4.6: Work Environment Stressors affecting workers

Source: Field Study (2016)

#### 4.4 EFFECTS OF JOB STRESS AND BURNOUT

The third section of the questionnaire (Section C) sought to identify the effects or visible symptoms that are evident in construction workers after being affected by stress. Table 4.4 showed the results of the effects of job stress and burnout evident in the construction workers after being affected by stress. The study categorized the effects into emotional outcomes, behavioral outcomes, cognitive (mental) outcomes and burnout.

Tuble III Lifetts of gos biles	Tina Da	Inour				
Effects of Job stress And	N	Mean	Std. Deviation	RII	Ranking	Overall Ranking
Burnout		-		(%)		
<b>Emotional outcomes</b>	204	3.28	0.637	66		
Anger	202	3.79	1.073	76	1st	2nd

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#### Table 4.4: Effects of Job stress And Burnout

Inability to make decision	200	2.79	1.035	56	4th	24th
Poor judgment	200	2.84	1.130	57	3rd	22nd
Inability to concentrate	200	3.48	0.896	70	2nd	9th
Poor working standards	200	3.57	0.995	72	1st	6th
Cognitive (mental) outcome	204	3.11	0.850	62	-	_
Procrastination or neglecting responsibilities	200	2.74	1.112	55	5th	26th
Repetitive absenteeism	202	3.12	1.046	62	4th	16th
Aggressiveness	202	3.48	1.164	70	3rd	8th
Drug and alcohol use	202	3.71	1.326	74	2nd	5th
Argumentative	202	<mark>3.7</mark> 4	1.090	75	1st	3rd
Behavioral outcome	204	3.32	0.782			1
Skin problems	202	1.79	1.097	<u> </u>	Sth	29th
stomach disorders and others	202 202	2.35	1.262	47	4th	28th
Diseases: high blood pressure	202	2.30	1.291	50	JIU	2011
Migraine and Headaches	202	2 90	1 291	58	3rd	20th
Sleep disturbances	202	3.08	1 311	62	1st 2nd	18th
Back pain	202	3.22	1.247	64	1 .	15th
Physical outcomes	204	2.64	0.973	33		
Isolation	202	2.76	1.038	55	6th	25th
Lack of confidence	198	2.82	1.172	56	5th	23rd
Nervousness and Anxiety	202	3.30	0.988	66	4th	12nd
Lack of energy and low morale	202	3.51	1.004	70	3rd	7th
Frustration		3.73	0.971	75	2nd	4th

Seeking for better job	202	3.93	1.015	79	1st	1st
Low organizational commitment	202	3.38	0.777	68	2nd	10th
Low job satisfaction	202	3.06	1.098	61	3rd	19th
Low personal accomplishment	202	2.87	1.071	57	4th	21st

#### Source: Field Study, 2016

It was observed that, effect on behavioral outcomes was the highest observing stress effect of index of 66 percent with mean score 3.32. The study observed nine significant probable effects of the job stress symptoms evident in construction workers after being stressed (Poon *et al.,* 2013). The effects were averagely indicated by respondents as somewhat probable; seeking for the better job, anger argumentative, frustration, and drug and alcohol use, poor working standards, lack of energy and low morale, aggressiveness and inability to concentrate. These effects indices ranged from 79 percent to 70 percent listed in descending order.

#### **4.5 ACCIDENTS ON CONSTRUCTION SITES**

Section **D** of the questionnaire; jobstress and burnout on accident occurrence, was used to address the first objective as discussed earlier. Several accidents were selected from literature (see OSHwiki, 2016). Respondents were asked to choose based on a likert scale of 1-5 the rate at which they experience the following construction site accidents, where "Not frequent" ranked 1, "Less Frequent" ranked 2, "Moderately Frequent" ranked 3, "Frequent" ranked 4 and "Very Frequent" ranked 5. The most frequent occurring accident in the process of carrying out duties was stepping on sharp objects; index was 82 percent and mean score was 4.09 (1.107). This is mainly due to the fact that metals and other sharp objects are most of the time scatted all over construction sites. The second ranked frequent occurrence was strenuous movement injuries, mean score of 3.66 and frequency index of 73 percent. This is as a result of the monotonous nature of construction activities carried out on the sites. Exposure or contact with

extreme temperature, electrocution and vehicular crushes were the least ranking accidents with mean of 2.15, 2.00 and 1.96 respectively.

Descriptive Statistics on Accidents	N	Mean	Std. Deviation	RII (%) 82	Ranking
Stepping on sharp objects	202	4.09	1.107		1st
Strenuous movement injuries	202	3.66	1.105	73	2nd
Being struck by falling objects	202	3.38	1.064	68	3rd
Falls from height	202	3.26	1.182	65	4th
Exposure or contact with extreme temperatures	200	2.15	1.198	43	5th
Electrocution	202	2.00	1.005	40	6th
Vehicular crushes	202	1.96	0.880	39	7th

 Table 4.5: Descriptive Statistics on Accidents

Source: Field Study, 2016



Figure 4.7: Accidents on Construction Sites

Source: Field Study (2016)

#### 4.6 RELATIONSHIP BETWEEN JOB STRESSORS AND STRESS EFFECTS

**Table 4.6** shows the relationship between job stressors and effects of the job stress and burnout. This was established through the use of the mean score for the measurement items under each construct. The correlation between the individual job stressors organizational, job demand and work environment and the various types of effects; emotional, physical, behavioral, cognitive and burnout were investigated. It was observed that, there was significant positive relationship between organizational stressors and emotional outcome (r = 0.578, p = 0.000 < 0.05), behavioral outcome (r = 0.515, p = 0.000 < 0.05), cognitive (r = 0.471, p = 0.000 < 0.05) and burnout (r = 0.550, P = 0.000 < 0.05). The study observed no significant relationship between organizational stressors and physical outcome (r = 0.073, p = 0.300 > 0.05). Job demand stressor has significant positive relationship with emotion (r =

0.553, p = 0.00 < 0.05), physical (r = -0.155, p = 0.027 < 0.05), behavioral (r = 0.308, p = 0.000 < 0.05), cognitive (r = 0.179, p = 0.010 < 0.05) and burnout (r = 0.145, p = 0.038 < 0.050). Increase in job demand stressors significantly increases emotion, behavioral, cognitive and burnout. However, it was obvious to see that when job demand stressors increase, a significant decrease in physical effects will be experienced.

-	E .	Emotional outcomes	Physical outcomes	Behavioral outcome	Cognitive (mental) outcome	Burnout
	Pearson Correlation	.578**	0.073	.515**	.471**	$.550^{**}$
	AND'	0.000		0.000	0.000	0.000
organizational stressors	Sig. (2-tailed)		0.300	20		
	N	204	204	204	204	204
	Pearson Correlation	.553**	155*	.308**	.179*	.145*
Tala daman	1	0.000	0.027	0.000		
JOD demand	<sup>1</sup> Sig. (2-tailed)				0.010	0.038

Table 4.6: Relationship between Job stressors and Effects

	Ν	204	204	204	204	204
Work environment stressors	Pearson Correlation Sig. (2-tailed)	.324** 0.000	.256** 0.000	.349** 0.000	.393 <sup>**</sup> 0.000	.366 <sup>**</sup> 0.000
511035015	Ν	204	204	204	204	204
Source: 1	Field Study, 2016					

#### **4.7 MEASUREMENT MODEL**

Analyzing and evaluating the constructs, Comparative Factor Analysis (CFA) was performed to ensure internal consistency of the model, scale reliability and construct validity of the measurement items before the main model assessment was executed. Based on the theories deduced from the literature review, Structural Equation Modeling (SEM) analysis was appropriate to measure the effect of stressors on the accident occurrence. In an attempt to ensure model fitness, two phases of analysis was undertaken. Factor analysis was first conducted to assess the reliability of the constructs. The second phase was the structural equation modeling analysis which tested the model fitness using incremental and absolute fitness approach. This is done by determining and explaining how each exogenous variable (job stressors) affect the values of the endogenous variables; accident on construction site.

This is made possible according to (Kline, 2010) by a comparative assessment that exist between the covariance matrix which emanated from particular sample and the covariance matrix emanating from the hypothesized model as well as fit statistics which was to determine the

acceptability of the findings obtained.

This is where the job stressors variables affect the endogenous variables (falls from height, vehicular crushes, electrocution, being struck by falling objects, strenuous movement injuries, stepping on sharp objects and exposure or contact with extreme temperatures). The test was

supported on the fact that job stressors impact on accident occurrence. The Exogenous variables serve as a cause of accident occurrence in construction site.

#### 4.7.1 Measurement of Goodness of-fit of SEM

The study measured the fitness of the model using incremental fitness (Comparative Fit Index) and absolute fitness (Root Mean Square Error of Approximation) even though there are several types (Kline, 2010). The result of the incremental fit recorded was 0.988 showing good fitness of the model. Scholars such as Benlter (2005) recommended an acceptable level of fit to be CFI > 0.90 and a good fit of CFI > 0.95. The study recorded fit value above 0.95 which showed the model was very good in terms of fitness. The value of RMSEA was 0.079 which was within the good and acceptable level of fitness. Lei and Wu (2008) recommended RMSEA, which projects a value less than 0.05 to be considered good fit and value less than 0.08 as acceptable fit. This showed that the RMSEA recorded in the study was acceptable fit. The model fitness was statistically good conforming to the conventional cut-off points.

Goodness-of-fit Measure	Levels of fit	Estimated Measure	Level
Incremental fit			/
CFI	$x \ge 0.90$ (Acceptable) $x \ge 0.95$ (Good fit)	0.988	Good
Absolute fit	- R	5 BA	
RMSEA	$x \le 0.08$ (Acceptable) $x \le 0.05$ (Good fit)	0.079	Acceptable

#### CFI, Comparative Fit Index

RMSEA, Root Mean Square Error of Approximation

#### Source: Field Study, 2016

### 4.7.2 Standardized Coefficient, Variance Accounted for and Model Testing of the Construct (JRS and AO)

Coefficient of determination (R<sup>2</sup>), which is used to determine the predictability of the variables

under experiment (Job stressors and accident occurrence) was resorted. Values of the R<sup>2</sup> are

computed between 0 (0 percent) to 1(100 percent). The greater the value, the better the fit.

Henseler (2010) developed a scale for describing the  $R^2$  values; where  $X \ge 0.75$  is

"substantial", X = 0.5 is "moderate", and  $X \le 0.25$  is "weak". The Cronbach"s Alpha which measures the reliability of the measurement items was used.

Indicator Variable	Standardized Coefficient	Z- Values	R Squared (R <sup>2</sup> )	Path Coefficient (SE)	Cronbach's Alpha	Significant level at 0.05
OS1	0.811	32.02	0.657			0.000
OS2	0.787	28.09	0.619			0.000
OS3	0.770	25.87	0.593	5	13	0.000
OS4	0.817	33.19	0.667		13	0.000
OS5	0.849	40.74	0.721	Sal	2ª	0.000
OS6	0.779	26.99	0.607	0 Y		0.000
JDS1	0.891	56.32	0.794			0.000
JDS2	0.823	34.32	0.677	0.004	0.004	0.000
JDS3	0.881	51.73	0.777	0.284	0.894	0.000

 Table 4.8: Standardized Coefficient, Variance Accounted for and Model Testing of the Construct

 (Job Related Stressors)

JDS4	0.854 42.03	0.730	0.000
JDS5	0.806 31.19	0.650	0.000
JDS6	0.799 30.07	0.639	0.000
WES1	0.184 2.67	0.034	0.008
WES2	0.450 7.88	0.202	0.000
WES3	0.440 7.62	0.193	0.000
WES4	0.837 37.66	0.701	0.000
<b>Overall Effect</b>		0.968	
	A COL		

Source: Field Study, 2016

 Table 4.9: Standardized Coefficient, Variance Accounted for and Model Testing of the Construct (Accident Occurrence)

Indicator Variable	Standardized Coefficient	Z- Values	R Squared (R <sup>2</sup> )	Path Coefficient (SE)	Cronbach's Alpha	Significant level at 0.05
ACCA	0.641	12.62	0.410		A A	0.000
ACCB	0.207	2.78	0.043	and		0.005
ACCC	0.105	1.35	0.011			0.177
ACCD	0.769	18.60	0.591	2	0.717	0.000
ACCE	0.719	16.22	0.516	<		0.000
ACCF	0.771	19.05	0.595	· · · · · · · · · · · · · · · · · · ·	12	0.000
ACCG	0.199	2.590	0.040	E	BAD	0.010
	1 0016		ALLE			

Source: Field Study, 2016

The Cronbach"s Alpha observed was 0.894. This value was higher showing the measurement items were satisfied both construct validity and internal reliability criteria. Based on theory,

three factors contributed to stress on construction site; organization stressors, job demand stressors and work environment stressors (see Leung *et al.*, 2010; Campbell 2006). The structural equation model was employed to measure the impact analytically focused on confirmed theoretically assumed relationship.

Determining the significance of the parameters estimated and the test statistics to assess the probability of the impact was conducted examining the values of the Standardized estimates and the Z-test (Kline, 2010). The standardized estimates and the Z- values obtained in the results revealed that the parameter estimated were more than the cut-off value of 1.96 which are adequate and reasonable in terms of the degree. The standardized coefficients were high greater than 0.5 (close to 1) which showed that the measurement items were observed to be associated with type of stressors on construction site.

The R-square which measured the amount of variance in the measurement items explained by the construct (factors) were adequate. The measurement items in the work environment stressors which had low variances were reasonable; inadequate ventilation accounted for 20 percent variance, poor lighting accounted for 3 percent variance and noise levels accounted for 19 percent variance. The results showed that the measurement items significantly identified the construct which all of them are associated with the stressors experienced on the construction site.

A standardized coefficient close to 1.00 indicates significant impact on the dependent variable. The level of impact of the exogenous variables on the dependent variables increases the standard coefficient resulting in the reduction in the significance level. Categorically, all the parameters of organizational stressors and job demand stressors had high standardized coefficient ranging from 0.770 to 0.891 with their respective statistically significant effect. The study observed one of the measurement items of work environment stressors, thus working in

dangerous environment (WES4) having high standardized coefficient of 0.837. The other three measurement items had their standardized coefficient below 0.5 however, they were statistically significant.

The standardized estimates and the Z- values obtained in **Table 4.9** revealed that the parameters estimated were all more than the cut-off value of 1.96. The standardized coefficients were high greater than 0.5 (close to 1) which showed that the measurement items were observed to be associated with type of stressors on construction site.

The path coefficient measured the predictive accuracy of the model which loading was 0.284. This was the composite effect of the exogenous variable''s R-square on the endogenous variable. The value of the overall effect of job related stressors on the endogenous variable (accident occurrence) was 0.968 (**Table 4.8**) which was observed to be highly significant. The model was observed to be fitting and construct was significantly reliable. The overall estimation of the model indicated that job related stressors significantly impact on accident occurrence in construction site.

#### 4.8 DISCUSSION OF RESULTS AND STRUCTURAL MODELS

#### 4.8.1 Accidents occurring on Construction sites

It is noted in **Table 4.5** that stepping on sharp objects scored highest in construction site accidents in Ghana representing a mean score of 4.09. This is consistent with Rahim *et al.* (2008) study which showed stepping on sharp objects to be the second highest accident occurring on construction sites in Malaysia. Stepping on sharp objects, falling from heights and struck by falling objects are the most occurring accidents in the Thai Construction industry as noted by Pipitsupaphol and Watanabe (2000). This is similar to the findings developed from the study as shown in **Table 4.5**. Falls from height, which is known to be the highest accident recorded in U.S. (OSHwiki, 2016) was ranked 4th with a mean score of 3.26. This result is

mainly due to the fact that most of the building projects carried out in Ghana are not as high rising as buildings in the U.S.

#### 4.8.2 Job Related Stressors affecting workers in Construction Site

Different people have different ways of responding to stress (Idris *et al.*, 2010). The factors that may cause stress in one person may be seen to be not troubling to another worker. This accounted for the results in **Table 4.3** for identifying the stressors that affects workers the most. Job demand stressors was noted to have the maximum effects on workers with a mean score of 3.74. Campbell (2006) identified the main causes of work place stress to be ambitious deadlines, too much work, inadequate skill, conflicting demands and pressure which are all classified under job demand stressors.

Organizations have a responsibility to provide a conducive working atmosphere for their employees. Ibem *et al.* (2011) noted these factors; low salary, insufficient staffing, poor communication and top management support as the organizational factors that bring stress to the workers on construction sites. These factors (organizational Stressors) were noted to be the second highest stress causing elements with a mean score of 3.54.

Work environment stressors was the least ranking stressors with a mean score of 3.02. This is mainly due to the fact that works on construction sites are mostly carried out in the open with lots of light and fresh air. As such, construction workers in Ghana do not consider the stressors in this group to have any major contribution to the work place stress they experience. This result is consistent with Ibem *et al.* (2011) study which identified exposure to high temperatures, noise levels and poor lighting to be the least impacting stressors affecting workers in the construction field.

Ambitious deadline is noted from **Table 4.3** to be the stressor causing stress in most construction workers. Leung *et al.* (2012) indicated that ambitious deadlines was the key source of work place stress. Companies when bidding for contracts tend to reduce the project deadlines in order to win contracts. This act tends to bring excess pressure to the workers on the site since they are the ones directly affected by such managerial decision. The second stressor with the highest rate of causing stress is low salary. A study carried out by American Psychological Association (2011) revealed low salary to be the principal cause of stress among workers. Promptly paying workers their salary or frequently compensating workers not only reduce stress but rather increase productivity on site.

#### 4.8.3 Discussion of Accidents due to Stress

Comparing the findings from Section 4.3.1 and 4.8.3, it is noted respondents indicated JDS2 (*ambitious deadline*) to be the stressor which affects workers the most on construction sites but considering the collective impact on accident occurrence, JDS1 (*workload*) is seen to be the stressor causing most accidents on construction sites. In order to cut down operational cost, management usually reduce the number of workers needed for the job. This tends to affect the coping capabilities of the workers due to the excess work they are required to carry out. Blaug *et al.* (2012) stated that workers mostly become stressed out when there is a disparity between the workload placed on them and their ability to meet such demands. Demanding nature of activities carried out on construction sites was noted by Bashir (2010) to be one of the factors that affect the safety behaviours of construction workers. According to Gyekye (2006) workers become susceptible to errors and accidents when they are bombarded with too much work than what they can actually handle.

WES1 (*Poor lighting*), WES2 (*Inadequate ventilation*), WES3 (*Noise levels*) were the least impacting stressors with a percentage variance of 3, 20 and 19 percent respectively. A coefficient of determination ( $\mathbb{R}^2$ ) less than 0.25 is considered to have a weak or no impact on

the endogenous variables. This is consistent with **Section 4.3.3** and **4.8.2** of the study which showed these stressors to be the minimum stress causing factors. The overall effect of job related stressors on the endogenous variable (accident occurrence) was 0.968 (**Table 4.8**) which was observed to be highly significant. This confirms that stress actually impacts on the occurrence of accidents on construction sites in Ghana.

Subsequently, the results from the endogenous variable showed; ACCF (0.60) *Stepping on sharp objects*, ACCD (0.59) *Being struck by falling objects* and ACCE (0.52) *Strenuous movement injuries* as the accidents that are mostly caused by stress. This is consistent with **Section 4.5** and **4.8.1** showed the same set of accidents as the most frequently encountered accidents on construction sites. This finding coincides with data obtained from OSHwiki (2016) which placed stepping on sharp objects and being struck by falling objects as the most frequent accident being reported by construction workers.

The results obtained from the SEM analysis supported for the third objective set for the study (see Section 1.4.2), and further proved the fact that stress actually has an impact on the accidents that occur on construction sites in Ghana.

#### **4.9 CHAPTER SUMMARY**

This chapter of the study focused on the impact of stress on the occurrence of accidents on construction sites. The chapter was in three main aspects. The first aspect was the demographic relationship of the respondents with emphasis on the age, job title and years of experience since they have the most influence on how stress affects a worker. Under job related stressors, it was noted that ambitious deadlines, low salary and working in a dangerous environment were the highest ranking factors that cause workplace stress. The endogenous variables also showed stepping on sharp objects, strenuous movement injury and being struck by falling object as the most frequent accidents encountered on construction

sites.

The final aspect of this chapter was focused on the relationship between the stressors and the accidents that occur on construction sites. The overall impact of the job stressors on accident occurrence achieved was 0.968 which denotes a very high influence. Workload was identified to be the stressor impacting the most on accident occurrence. The CFI and RMSEA values identified in the study showed levels of good and acceptable fit respectively. This implies the model developed is dependable and can be relied upon.

#### **CHAPTER FIVE**

#### **CONCLUSION AND RECOMMENDATION**

#### **5.1 INTRODUCTION**

This is the last chapter of the study investigating the impact of stress on the occurrence of accidents on construction sites. The chapter is structured to review the research objectives in tandem with the findings confirmed from the analysis of data in chapter four. In addressing the aim, a careful evaluation was carried out to first of all, identify the specific job related stressors that affect workers on construction sites. Also, the most frequently occurring accidents were also identified. Out of all the data derived, the significant impact of work place stress on the occurrence of accidents as well as the most impacting stressors was identified. The final chapter, which is a summary of the entire study, will address the conclusion and recommendations of the study.

#### **5.2 CONCLUSION (FINDINGS ON THE VARIOUS OBJECTIVES)**

The findings of the study are presented in congruence with the objectives of the study. The three objectives as indicated in **Section 1.4.2** are addressed in the subsequent sections.

#### 5.2.1 Objective One: Identify the accidents that occur on construction sites in Ghana

Upon reviewing the literature, seven (7) accidents were chosen to be the common accidents suffered by workers on construction sites. The various accident causation models, as well as the relationship existing between stress and construction site accidents were also reviewed. The main aim behind this objective was to identify the most frequently occurring accidents suffered by workers on construction sites and to also identify the accidents that mostly occur as a result of workers being stressed out. The results from the study were ranked based on the frequency of their occurrence. It was found out that stepping on sharp objects, strenuous movement injuries, being struck by falling objects, falls from height, vehicular crushes, exposure to extreme temperatures and electrocution in a descending order, are the most occurring accidents on construction sites. Stepping on sharp objects was also noted to be the accident that occurs mostly as a result of work place stress.

### 5.2.2 Objective Two: Identify the various job stressors that affect workers on construction sites in Ghana

Several work place stressors were identified from the literature reviewed. These stressors were placed under the following themes; Organizational stressors, Job demand stressors and Work environment stressors. The findings from the study revealed job demand stressors to be the stressors that affect workers the most on construction sites. The stressor group included; workload, ambitious deadline, role conflict, role vagueness, variations in scope of work and insufficiently skilled for work. Organizational stressors, which ranked the second most impacting stressor also had the following stressors: low salary, inadequate training in safety, employers focus on productivity, poor communication and information dissemination, insufficient staffing and poor top management support. Work environment stressors were noted from the study to be the least impacting job stressor. The stressor group included; inadequate

ventilation, noise levels, poor lighting and working in dangerous environment. The overall ranking of all the identified stressors showed ambitious deadlines to be the stressor reported by most of the respondents to be causing stress on the construction sites.

## **5.2.3** Objective Three: Evaluate the impact of stress experienced by workers on the occurrence of accidents on construction sites

Based on the information derived from the literature review, a quantitative questionnaire was developed to investigate the influence of stress on the occurrence of accidents on construction sites. The Statistical Package for Social Sciences (SPSS) version 20, statistical software was first used for estimation of descriptive statistics (mean and standard deviation) and Stata 13 was used to ease the development of the model. Structural equation model (SEM) was used as an analytical tool to examine the interrelationships existing between stress and accidents and also determine how much influence stress has on the occurrence of accidents on construction sites. The findings confirmed the information derived from the literature review that stress actually has an impact on the accidents that occur on construction sites. Workload was noted to be the stressor which had the most influence on the occurrence of accidents on construction sites. With respect to accidents, stepping on sharp objects was noted to be the accident that occurs mostly as a result of workplace stress.

#### 5.3 LIMITATIONS TO THE STUDY

Several factors were identified to have restricted the findings in the study. These limitations were identified in the process of carrying out this research;

 Respondents for the survey were all centred in one region of Ghana. This can be seen as a representation of the ideas of construction workers in a specific region of Ghana. As such it will be imperative to replicate this study in the other regions of Ghana to either confirm or dispute the results obtained from the study.
- Another major limitation was the fact that respondents needed to remember accidents they had experienced over the last 12 months as indicated in the questionnaire. There was a possibility of memory error which could have affected the findings.
- The sample size of 204 is considered small as compared to the number of construction personnel practicing in the country at large.

#### **5.4 CONTRIBUTION TO KNOWLEDGE**

Accidents have been noted by many studies to have a greater negative impact on construction projects. Several of such studies identified stress to be one of the headline causes of accidents on construction sites. In an attempt to identify the magnitude of the influence stress has on the occurrence of these accidents, several researchers in the U.S and UK carried out studies aimed at identifying the impact. However, no study has been carried out in the sub region to actually ferret out the impact of stress on the occurrence of accidents on construction sites in Ghana. The study, upon identifying the relationship existing between stress and accidents, go ahead to determine the impact each identified stressor has on the accidents. The identified stressors can be monitored and dealt with as and when they are encountered. This study finally, adds substantial contribution to the already existing body of knowledge on the causes of construction accidents with special insight given to the effect of organizational stress on causing construction accidents.

#### **5.5 RECOMMENDATIONS**

In an attempt to address the various stressors that bring about work place stress per the findings attained, the following recommendations were drawn up.

• When planning a schedule for any project, realistic time should be given to the individual work packages. Clients should be made to understand that delivering projects within the shortest possible time do not only affect the project financially but also

affects the workers. Hence projects should be carried out with realistic and standard deadlines.

- The main cause of workplace stress is the inability of the worker to cope with the demands placed on him. To prevent stress, workers should be made to carry out activities which are within their capability.
- Construction sites should be planned safely to enhance a healthier working environment. Poor organisation of the construction site increases the chances of being affected by stress and the potential of injuring oneself eventually. Construction sites should be planned so as to keep the work area and all other areas safe and tidy.
- Strenuous movement injuries are very common on construction sites due to the nature of the activities being carried out on the sites. To prevent such injuries, workers should be made to take their breaks so that they can relax their body for some time. Also proper ways and postures of lifting objects and carrying out works should be taught to reduce the risk of strenuous movement injuries.
- Records of accident or stress symptoms should be kept and workers allowed to freely report stress symptoms. Such records if kept can be used to establish stress and accident patterns. Management can then make decisive decisions on ways to prevent or solve any such risks that will arise in the future.

#### **5.6 FUTURE RESEARCH**

This research, just as any other study has its own limitations. In address the issues limiting the study, the following future research works are proposed.

• Similar studies should be carried out on managers and other professionals who have proper education in stress and accidents in the construction industry. These persons

may give a better response as to how much they are affected by stress and how it impacts accident occurrence on construction sites.

- Only registered construction companies were accessed in this study. As such future studies should consider assessing the informal or unregistered construction companies as they are not regulated and obliged to follow any safety or environmental rules and regulations.
- Future studies should also consider assessing the impact of stress in relation to accident data derived from the construction companies. This would give an accurate view on the specific accidents and their frequency of occurrence.
- By way of controlling the effect of stress, future research studies should also consider the disquiets that may be experienced when workers report stress symptoms to managers and the effects that it may have on their careers.



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#### APPENDIX

#### KWAMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

#### DEPARTMENT OF BUILDING TECHNOLOGY

#### **QUESTIONNAIRE**

Masters of Science in Construction Management

Thesis Topic: IMPACT OF STRESS ON ACCIDENT OCCURENCE ON CONSTRUCTION

SITES IN GHANA

Preface

This research is intended to investigate the impact of stress on the occurrence of accident on construction sites in Ghana. It is also going to elicit the relationships that exist between the stress experienced by construction workers and the role they play in causing accidents on construction sites in Ghana.

Please respond to the questions by ticking  $(\sqrt{})$  the appropriate box for each item. Please note that all information provided will be strictly treated as confidential as this work is for academic purposes. In case of any enquiries concerning the questionnaire, please do not hesitate to contact

Name: Michael Obeng Duah Email: <u>micobeng25@gmail.com</u> Mobile: 0249244990

#### SECTION A: GENERAL INFORMATION

- 1. Gender [] Male [] Female
- 2. What is your age
  - [ ] 18-30 years
  - [ ] 31-40 years
  - [ ] 41-49 years
  - [ ] 50 years and above
- 3. Job title or position
  - a) [ ] Boilermaker
  - c) [ ] Combination welder
  - e) [ ] Foreman
  - g) [ ] Ironworker (steel erector)
  - i) [ ] Heavy equipment operator (digger, excavator, etc.)
  - j) [ ] Mason k) [ ] Painter
  - I) [ ] Plumber
     m) [ ] Safety officer
  - n) [ ] Truck driver \_\_\_\_\_\_ o) [ ] Welder
- 4. How long have you been in construction industry?.....

# SECTION B: JOB RELATED STRESSORS

5. What would you say about how the following job stressors affect the workers on construction sites? Kindly rank them using the following Likert scale: 1=Not severe; 2=Less severe; 3=Moderately Severe; 4= Severe; 5=Very severe. Please tick (√) in the space provided.

b) [ ] Carpenter

h) [] Laborer

d) [] Electrician

f) [ ] Instrument technician

3	1	2	3	4	5
I. Organizational stressors	2	/			
1. Inadequate training in safety					
2. Low salary					
3. Employers focus on productivity and ignore their employee"s safety					
4. Poor communication and information dissemination					

5. Insufficient staffing				
6. Poor top management support				
II. Job demand stressors	•		•	•
1. Work load (overload or under tasked)				
2. Work schedule (ambitious deadlines)	Г	6.2		
3. Role conflict				
4. Role vagueness				
5. Variations in scope of work				
6. Insufficiently skilled for work				
III. Work environment stressors		11		L
1. Inadequate ventilation				
2. Noise levels				
3. Poor lighting				
4. Working in a dangerous environment				

# SECTION C: EFFECTS OF JOBSTRESS AND BURNOUT

1. The following are effects of job stress and burnout, in your opinion and experience how

are these symptoms evident in construction workers after being affected by stress?

Using the scale Likert scale 1-5 (level of probability); 1=Not Probable,

# 2=Somewhat improbable, 3=Neutral, 4= Somewhat Probable and 5=Very

Probable

Effect of Job Stress	1	2	3	4	5
Emotional outcomes		2	2	/	
1. Nervousness and Anxiety	2				
2. Frustration	-				
3. Lack of energy and low morale					
4. Anger					
5. Isolation					
6. Lack of confidence					
Physical outcomes					

1. Migraine and Headaches	
2. Back pain	
3. Sleep disturbances	
4. Skin problems	
5. Diseases: high blood pressure, stomach disorders and others	
Behavioral outcomes	
1. Aggressiveness	
2. Drug and alcohol use	
3. Argumentative	
4. Repetitive absenteeism	
5. Procrastination or neglecting responsibilities	
Cognitive (mental) outcomes	
Cognitive (mental) outcomes       1. Inability to make decision	
Cognitive (mental) outcomes         1. Inability to make decision         2. Inability to concentrate	
Cognitive (mental) outcomes         1. Inability to make decision          2. Inability to concentrate          3. Poor working standards	
Cognitive (mental) outcomes         1. Inability to make decision          2. Inability to concentrate          3. Poor working standards          4. Poor judgment	
Cognitive (mental) outcomes         1. Inability to make decision          2. Inability to concentrate          3. Poor working standards          4. Poor judgment          Burnout	
Cognitive (mental) outcomes         1. Inability to make decision          2. Inability to concentrate          3. Poor working standards          4. Poor judgment          Burnout          1. Low job satisfaction	
Cognitive (mental) outcomes         1. Inability to make decision         2. Inability to concentrate         3. Poor working standards         4. Poor judgment         Burnout         1. Low job satisfaction         2. Low organizational commitment	1
Cognitive (mental) outcomes         1. Inability to make decision         2. Inability to concentrate         3. Poor working standards         4. Poor judgment         Burnout         1. Low job satisfaction         2. Low organizational commitment         3. Seeking for better job	
Cognitive (mental) outcomes         1. Inability to make decision         2. Inability to concentrate         3. Poor working standards         4. Poor judgment         Burnout         1. Low job satisfaction         2. Low organizational commitment         3. Seeking for better job         4. Low personal accomplishment	1

## SECTION D: JOBSTRESS AND BURNOUT ON ACCIDENT OCCURRENCE

10. How would you rank the following occurrence of accident base on your opinion and

experience in the process of carrying out your duties in the past 12 months?

# Where 1=Not frequent, 2=Less Frequent, Moderately Frequent, 4=Frequent and Very Frequent

					and the second second
Accidents on construction sites	1	2	3	4	5
1. Falls from height	1	2	2	>	
2. Vehicular crushes		1			
3. Electrocution	1				
4. Being struck by falling objects					
5. Strenuous movement injuries					
6. Stepping on sharp objects					

7. Exposure or contact with extreme temperatures			
8. Others (Please Specify)			

### SECTION E: IMPACT OF STRESS ON ACCIDENT OCCURRENCE

11. Please indicate the extent to which these stress causers affect each of the seven accident occurrence (A, B, C, D, E, F and G) on the construction site, using the Likert scale from 1-5 where, 1=Very low 2=Low 3=Medium 4=High and 5=Very high

**A.** Falls from height

- **B.** Vehicular crushes
- C. Electrocution
- D. Being struck by falling objects
- E. Strenuous movement injuries
- **F.** Stepping on sharp objects
- **G.** Exposure or contact with extreme temperatures

#### **Examples:**

i. How does inadequate training in safety affect falls from height (A)? Writing (4)

in the box of "A" indicates that it affects it high.

ii. How does inadequate training in safety affect vehicular crushes (B)? Writing (2) in the box of "B" indicates that it affects it low, etc.

	EL AN	A	B	С	D	E	F	G
Org	anizational stressors	1	3	3	5	/		
1.	Inadequate training in safety	8	5	/				
2.	Low salary	2						
3.	Employers focus on productivity and ignore their							
emp	oyee"s safety							
4.	Poor communication and information dissemination							
5.	Insufficient staffing							

6.	Poor top management support
Job	demand stressors
1.	Work load (overload or under tasked)
2.	Work schedule (ambitious deadlines)
3.	Role conflict
4.	Role vagueness
5.	Variations in scope of work
6.	Insufficiently skilled for work
Wo	rk environment stressors
1.	Working in a dangerous environment
2.	Inadequate ventilation
3.	Noise levels
4.	Poor lighting
	MIRNS ROOM DATE NO