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### RESEARCH ARTICLE

#### MEASURES AND STRATEGIES FOR MANAGING SAFETY ON CONSTRUCTION SITE.

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#### Abstract

The construction industry is inherently risky, with a substantial number of accidents. Moreover, most construction firms aims at completing projects on time, especially with different projects at hand thereby neglecting the safety aspect of the workers. In most construction companies, adequate concentration is not allocated to the areas of health and safety and this has been a great problem over the years. To support in addressing this issue, this work planned with the aim to recommend measures and strategies for managing safety on construction sites. Data collected was analyzed with the Statistical Package for Social Science (SPSS) and the Relative Importance Index (RII) was also used in grading. It was therefore disclosed from the findings that poor planning at site, unsafe working conditions with others are some of the major causes of accident at site. Construction companies should consider the need for special training for workers and also to create a group of internal health and safety monitory experts were some of the recommendations made.

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#### Introduction:-

Construction project is always liable to health and safety risk because of the nature, working environment, types of plants and equipment and methods used at sites. Haslam et al. (2005) stated that, the construction sector is seen as one of the most subject area to accident due to its low state of safety.

Health and Safety Executive (HSE), also stated that, for over twenty five (25) years, Two Thousand and Eight Hundred (2800) construction employees die in UK because of injuries sustained from poor safety conditions (HSE, 2009).

Throughout the world, construction activities has an intensive role to play in every economy's growth. (Ofori, 2012), demonstrates that construction brings into play between 5 and 10 percent of Gross Domestic Product (GDP) in every country and effectively use up to 10 percent of the workers. The government of Ghana initiated regulations and laws, such as Worksmans Compensation law 1987 (Labour Act 2007) and Labour Act on health and Safety, shops and offices Act 1979 (Act 328) on events within the construction industry to curb issues linked to site accidents.

An estimated number of about six thousand (6,000) workers die every day due to accidents at site as stated by the International Labour Organization, (2005).

Almost all construction company centers on executing the project, mostly when there are extra projects at hand by that, ignoring the safety areas of the workers. According to (Kheni et al., 2006), the preceding complication in construction may be considered to have different impact on the safety outcomes in needed safety performance of construction sites in developing economies in which Accra Metropolis is no exception to this. Strategic Forum (2005) indicates that, active safety management practices cultivate an elevated productivity.

The aim of this paper is to identify measures and strategies for managing safety on construction site.

This aim could be achieve by:

1. Identifying the potential cause of accident at construction site,
2. Identifying measures and strategies to manage safety on construction site.

### **Safety**

The protection and prevention of individuals and people from any form of accident and risk that comes as a results of injury, harm, unhealthy environment for working at the place of work. Anaman and Osei Amponsah (2007), stated that the law of safety is defined as a way in which the working environs can strengthen to secure the safety and health of people who are liable to be affected by the working environment.

In order to achieve safety objectives, officials, workers and management in the various associations must be focused and committed to safety programs.

### **Causes Of Poor Safety In The Construction Sector**

The National Institute for Occupational Safety (NIOSA), (2009) stated that, the nature of constructing work has a high status of safety incidents and this may include many built in hazardous works and conditions. The following are the different justification for the poor safety records in the construction industry:

#### **Nature of the Site and Project**

1. Conditions at site
2. Project scope

#### **Workforce Nature**

Types of workers and consideration

#### **Construction Accident**

.according to Ridley and Channing (2003), accidents are unexpected or unplanned events which is as a results of actions that may results in damage, injury, loss or combination of all. In most instances, activities that lead to accident can be controlled and that indeed brings about safety. By the provision of safe working conditions, impressive training on safety and adhering to the practice of safe working procedures and working tactics are some of the aims of preventing accident.

#### **Types And Causes Of Accident At Site**

Some causes of accident as identified by HSE (2004), as the consequences of unsafe working conditions, Ferret and Huges (2007) also attributed unsafe working conditions to some crucial causes such as: unsafe conditions, workers unsafe acts and the reactions of management. These related factors are shown in Table 2.1. The causes stated in Table 2.1 is likely to contribute massively to the cost of a contractor (Lancaster et al. 2003).

HSE (2006) states that accidents influence the productivity rate negatively and an increase in insurance cost. It further stated that, accidents can:

1. Decrease the motivation of workers
2. Cause delays in project progress
3. Disorganize the construction process.

**Table 2.1:-Causes of Accidents on construction project site**

<b>Unsafe Acts</b>	<b>Unsafe conditions</b>	<b>Management related causes</b>
Failure to wear or use PPE	Lack or missing guards	Inadequate planning

Inability to warn others of danger	Unavailability of guardrails	Improper design
Placing equipment in dangerous conditions	Faulty tools and equipment	Absence of awareness and training
The use of faulty tools	Poor warning on fire systems	Lack of communication
In position with mobile machinery	Noise	Ineffective management policies
Struck by motion vehicle	Fire hazards	Non compliances
Struck by flying object	Dangerous conditions	
Manual handling	Lack of inadequate light	

Source: HSE, (2004)

Kripendruff (2004), indicated the types of accidents on project sites as:

1. **Poor quality tools:** this is the case where tools to be used are of poor quality and they contribute to cases of accidents like: tinny rusty particles in the eye.
2. **Method of work:** This consist of the approach used in executing every activity includes but not limited to: poor manual handling, unsafe loading practice, unprotected shoring.
3. **Unfortunate error:** this comes about as a result of behaviors, and includes carelessness, poor planning, human error, poor hold of tools, poor observation, and may also lead to slip or fall on wet grounds.
4. **Set up of site:** site organization is very important and handling of tools and equipment also contribute to accident if care is not taken.

#### **Actions For Improving Construction Safety**

The Construction Industry Institute (CII), (2003) carried out investigations to identify actions that shows improved records on safety. The results determined by the CII research team brought out some actions to use and they include:

#### **Management Participation in Accident Investigation:**

It was recorded that companies with its top management actively involved in the investigation of accidents were able to minimize the rate of accidents in their firms. The following measures are putted in place when managements are involved:

1. Ensuring adequate training of safety for staff
2. Appointment of safety officer

#### **Safety Planning:**

The study found out that institutions that carry out specific safety plans always record low accident rate. Safety planning must always be done effective and applied to all areas of the job to be executed and also very important to involve all stakeholders.

#### **Investigation and Reporting of Accident**

Though these are required by law, the study didn't miss it out. Companies that do not miss any little information were also found to improve in areas of safety, where as those who do miss were found to increasing in injuries.

#### **Alcohol and Drug testing**

The CII study found safer companies and stated that where companies conduct random testing on alcohol and drugs recorded low accident issues.

#### **Preventive Measures**

Various preventive measures should be taken into deliberation during project execution to prevent site accidents and injury in the event of occurring. These are as follows:

#### **Safety Nets**

Safety nets are tools that fastens a construction worker to a point by strengthening and supporting him/her to carry their duties at height. They further added that it decreases the events of falling from heights.

### Personal Protective Equipment

Davies and Tomasin, (1996), Personal Protective Equipment (PPE) should at all times on the site be worn. Huang and Hinze (2003) also indicated that PPE could help prevent injuries and also decreases the effect of injury at site. They further explained that. Basic PPE includes, reflective jacket, helmet, and safety eyewear.

### Signals and signs

When Signs and signals are allocated to alert workers on site safety and hazardous conditions it helps minimize the risk of injury. Davies and Tomasin, (1996) added that signal and signs informs the workers in taking extra caution to avoid injury.

### Methodology:-

Based on the research objectives, quantitative data was used for this paper. The study was based on purposive sampling. This is also a model of non – probability sampling technique. The main objective of a purposive sampling is to be centered on a particular population that will bring out the right answer for the research questions.

Erbil et al, (2010) also states that, purposive sampling technique allows the researcher to select people with broad ideas on the subject matter. The study also involved a population of fifty (50) experts as the sample size, ten (10) respondents from each construction site. Architects, general foremen, structural engineers, electrical engineers, quantity surveyors, plumbers, carpenters, steel benders, brick layers and labourers were therefore considered from each of the construction site stated. Ten respondents from each site were taken since the study needed precised result.

Therefore, a total of fifty (50) questionnaires were personally sent out for the data collection. Statistical Package for Social Scientists (SPSS) was used in the analysis.

### Results And Discussions:-

Every data used in the analysis was first-hand information collected from the sample of interest.

#### Causes Of Accidents At Sites

Respondents were tasked to rate the causes of accident at site by using the scale of 1-4. Based on the response, ranking was also done by using the combination of Relative Important Index (RII) and the mean score ranking. Where two (2) variables have the same RII, the one with the highest mean is ranked higher. The results in the findings are shown in the table below.

**Table 4.1:-**Causes of accidents at site

Causes of Accidents in the Construction Sector	Total	$\sum W$	Mean	RII	Rank
Poor planning at site	50	183	3.66	0.92	1
Falling of equipment	50	180	3.60	0.90	2
Poor usage of PPE	50	179	3.58	0.90	3
Unsafe working conditions	50	163	3.26	0.82	4
Poor handling practice	50	161	3.22	0.81	5
Lack of communication tools	50	151	3.02	0.76	6
Poor quality tool usage	50	148	2.96	0.74	7

The following are the most critical causes of accidents at site

1. Poor planning at site
2. Falling of equipment
3. Poor usage of PPE
4. Unsafe working conditions

#### Poor planning at site

Poor planning at site by the respondents was ranked as the very frequent factor that causes accident at site with RII value 0.92 and a mean of 3.66 and the results been 37 respondents rating very frequent, 11 respondents also rated frequent. It was only 2 respondents who rated not frequent and the rest of the respondents rated less frequent to confirm the validity of its happening. In reference to the type of most sites and more projects at site, also looking at

the end product, the tendency of planning at a particular site tends to be reduced. Construction is like all other works, dangerous and hazardous in its operations. Therefore, there was the need to create concern of rampage in accident happenings.

### **Falling of equipment**

This was also ranked to be the second factor to be the cause of accidents at site. Falling of equipment can be in different forms, the placement of equipment at site, the usage of them, coverings of the equipment, therefore making it important to be sure all equipment are placed in good and secure position to prevent them from falling. This also came with a RII value of 0.90 and its mean factor of 3.60. The digest confirms the falling of equipment at the construction sites and this is an issue of concern and needs to be treated as such. It was also indicated that, employers must provide fall protection and right equipment's for the work to be executed. It is therefore advisable to provide workers with the exact kind of materials to get the work done safely.

### **Poor usage of Personal Protective Equipment (PPE)**

Poor usage of Personal Protective Equipment was not so surprisingly to be ranked as the third factor to cause accident on site due to ignorance from both the workers and management to ensure its been used properly. Controlling an accident at the root, makes it the appropriate way to prevent it. Though unsatisfactory usage of personal protective equipment had an RII value of 0.90, it is an equipment which is worn to reduce the exposure of different kinds of hazards and these includes, gloves, eye and foot protection. It was also noted that employers and employees need to understand the types of PPE, select the appropriate PPE for different circumstances.

### **Unsafe working conditions**

Unsafe working conditions with RII value 0.82 and a mean of 3.26 was ranked as the fourth factor to cause accidents on site. With the various sites visited, some conditions were laid down as some of the unsafe working conditions that were very common at sites. These include: walking behind, under or walking in the path of cranes or heavy equipment. When such activities are done, it exposes the worker to accident. Taking breaks and lunch should only be at a designated area.

### **Measures and strategies to manage safety on site.**

In this segment, the respective respondents were tasked to rate the importance of the measures and strategies to manage safety on site by using the scale of 1-4. Based on the response, ranking was done using the combination of Relative Important Index (RII) and mean score ranking. Where two (2) variables have the same RII, the one with the highest mean is ranked higher.

The results in the findings shows:

**Table 4.3:-**measures and strategies to manage safety on site

<b>Measures and strategies to manage safety on site</b>	<b>Total</b>	<b><math>\sum W</math></b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>RII</b>	<b>Rank</b>
Emergency planning	50	185	3.70	0.948	0.93	1
Effective implementation of preventive system	50	183	3.66	0.746	0.92	2
Effective monitoring on site	50	182	3.64	1.657	0.91	3
Participation of management in accident investigation	50	172	3.44	0.542	0.86	4
Safety planning	50	165	3.30	0.839	0.83	5

### **Emergency planning**

Asides the high benefits of rendering guidance in areas of plan development and emergencies, there are also unrecognized dangerous circumstances that will bring about an increase in emergency situations can be eliminated. The planning process also exposes short comings on unnecessary low accidents. The overall objective of emergency planning is to prevent fatalities, reduced damage to buildings, protect the environments among others. Installation of emergency alerts at the site to reduce disasters and fatal accidents were perceived. RII value 0.93, Standard Deviation 0.948 and a mean of 3.70.

### **Effective implementation of preventive system**

It is important to use appropriate PPE at adequate times. Management will do more good when right tools are used for the specific assignments or project at the right time. A RII value 0.92, Standard Deviation 0.746 and a mean of

3.66 was obtained. It is therefore important to employ the services of skilled and trained personnel's instead of armature ones and also accidents prone sites should be well restricted.

Provision of adequate protective clothing to workers fully under operation is essential in preventive systems also protective clothing must be available that even security personnel should be given to wear. This is because it serves as the primary security to the host. The adequate provision of the clothing will make workers look genuine and also promotes health and safe condition to the users.

#### **Participation of management in accident investigation**

It was recorded that, when top management participates in the investigation of injuries and accidents it will be able to decrease the rate of accidents in their firms. When managements are involved, the following measures can be putted in place appointment of safety staff. Ensuring adequate training for staff, budgets are prepared for safety and managed accordingly, ensures the adequate provision of cost and time of safety measures. Based on that, respondents ranked this with a RII value 0.86, Standard Deviation 0.542 and a mean of 3.44

When managements are involved, the following measures should be structured well:

1. Appointment of safety staff.
2. Ensuring adequate training for staff
3. Budgets are prepared for safety and managed accordingly.

#### **Safety planning**

The planning of safety at the site would reduce accident rates. It was induced that, when safety is critically planned, it helps reduces the rate of accident. If measures are put in place, the working environment become conducive for all. Safety planning obtained an RII value 0.83, Standard Deviation 0.839 and a mean of 3.30.

Management should encourage workers to abide by constructional safety rules and regulations. This alone could lower the increase rate at which accidents occur at site. Establishment of penalties could also let operators and other workers bond to it better.

Also implantation of safety indicators at working areas should be installed so as safety notices and warning lights and alarms at the construction sites under operations. This is to promote safety grounds for the workers and their management at the site.

#### **Conclusion:-**

In reference to the data received, it can be indicated that respondents have knowledge about safety issues with regards to construction works. Although, the construction sites practice safety measures, they record less frequency for the general information on construction safety. This is because of inadequate managerial skills to support safety conditions at the construction sites. Workers also ignore safety indicators and do not apply them during operations. The strategy shows all what it takes to start the process adoption by determining the organizational current status and readiness for accident and illness solutions, perceived benefits, in terms of cost and strategy implementation, required training for the construction practitioners and a legal framework that will protect both the worker and the management of the construction industry.

The related studies also acknowledge that the advent of health and safety, offers an unprecedented opportunity to reduce incidental costs and increase efficiency for the contractor. Such strategy, however, must be open, interoperable and approved to safeguard the integrity of a construction worker and his immediate environment. Any process should not affect the legal rights and responsibilities of construction managers and contractors.

The developed measure and strategy to manage on safety at the construction sites starts with total awareness of the problems the construction sites are facing. For the construction sites to adopt the developed strategy, they must therefore check their status and readiness for the implementation of the system. If the analysis is affirmative, they can proceed on and if not, then they have to update their system to admit the new ways of constructional proceedings. For the process to continue there should be another analysis on the perceived benefits followed by the acquisition of resources which can enhance effective operations so far as construction is concern. There should also be education for workers, operators and management team for the proper running of the proposed strategy. The strategy to be used must be well planned to save cost from other resources. The client awareness and education is also relevant because of their involvement in the project to be constructed. The strategy should be tested and

assessed to know its strength and weakness. Legal framework should therefore be put on the system if the process proves right.

The building blocks used in the strategy developed was therefore taken from the analyzed collected data in this section. The answers given were very sufficient to develop the measures and strategy to manage the situation at hand.

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