

# Conference Proceedings

Joint Safety, Health, and Well-Being  
in Construction (W099) and People  
in Construction (W123) International  
Conference

## Harmony in Global Construction Trends: People, Technology and Society

KNUST, Kumasi, Ghana, 08-11 October 2024

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# Investigation into the Safety Performance of Building Contractors in Ghanaian Construction Firms

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**Keywords:** Safety Performance,  
Occupational Health and Safety,  
construction industry, Building  
contractors, Construction safety,  
Accident

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**Abstract:** In spite of its socioeconomic significance, the construction industry is infamous for being one of the most dangerous industries, causing a huge number of non-fatal and fatal accidents. Accidents and fatalities in the Ghanaian construction industry are especially high compared with those of other developed countries. Accordingly, the purpose of this research is to investigate the safe acts implemented by the building contractors in the Ghanaian construction industry to suggest ways to boost safety performance aimed at improving worker safety, and increase productivity. A quantitative methodology was employed in this study, where closed-ended questionnaire was prepared, and data was collected from building contractors in Ghana. A total number of Two hundred and Fifty-Two construction firms participated in this exercise. This number was obtained through simple probability sampling, where all construction firms stood equal opportunity to participate in the exercise. Data was analysed using mean scores, and standard deviation. The results of the survey indicates that the implementation of safety performance by the building contractors in Ghana is overall moderate. The research thus recommended that, there should be a strong regulatory culture of accountability, deter unsafe practices, and encourage the implementation of robust safety management systems. It is also recommended that improving construction safety performance in Ghana requires the implementation of safe acts and conditions throughout the project lifecycle. And comprehensive safety training and education programs are vital for improving construction safety. Further study could conduct an in-depth evaluation of the effectiveness of health and safety training programs within construction firms. Analysed the impact of different training methodologies, frequency of training sessions, and the use of immersive technologies in enhancing safety awareness and competence among workers. Identify best practices in training delivery for optimal outcomes.

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## Introduction

The construction sector in Ghana contributes to the socioeconomic expansion of the country's economy. According to [1], the growth of construction activities was 8.5% in 2010, 8.9% in 2011, 10.55% in 2012, and 12.6% in 2013. In addition, it increased by 13.5% in 2015, 13.7% in 2016, and 13.7% in 2017. This makes the construction industry the second largest contributor to Gross Domestic Product [1], showing a 240% quantum leap within a decade [2]. Ghana's construction sector has seen significant growth in its building operations. Due to the increased rate of urbanization and growth, there is a greater demand from

both residential and commercial customers, which is driving up the number of building projects. This also facilitated the hiring of skilled and unskilled labor in the building industry. It employed 316,368 and 309,132 working class people in the formal and informal sectors of the Ghanaian economy respectively. This represents 3.4% and 3.5% in the formal and informal sectors respectively; meaning nearly 7% of the working population in Ghana are engaged in construction [2]. Considering the significance of the construction industry on the national economy, it is incumbent on all stakeholders, particularly the government, to work together to ensure the sector's safety performance. This includes developing effective strategies and responses to address the weaknesses and threats confronting the industry [2]. Ghana has enacted and ratified various statutes and regulations that are aimed at safeguarding the health and safety (H&S) of workers [3]. Even with all these developments, [18] acknowledged the unacceptably high rate of accidents in the construction industry, and it is predicted that the numbers will increase in parallel with the pace of industrialization. An accident is usually an unplanned and unexpected event, which results from a mistake somewhere, somehow and by somebody [4]. Some of these mistakes result from easily recognisable hazards, which are preventable [5]. Identifying the reasons of the high rate of accidents and poor industrial safety track records is crucial in developing countries. The lack of experience from developing countries' technology and machinery is quoted as a cause [6]. One of the suspects of the high-rated incidents is the lack of training and skills in developing nations [6]. Accident would only be reduced in the construction sector through effective Organisational Health and Safety (OHS) management and ratification of International Labour Convention 1981 (No. 155) [7]. It is recommended that OHS issues be taken seriously at all levels to deal with the challenges facing the construction sector [8]. OHS is a scientific discipline that is concerned with maintaining worker safety [9], and the maintenance and protection of the workplace's infrastructure and human resources [10]. OHS makes sure that there are no illnesses or injuries brought on by occupational dangers [9]. Professionals in the field of occupational health and safety also work to avert catastrophic losses [10];[9]. In reality, moral and financial considerations are part of occupational safety and health [11]. Empirical evidence from many researchers shows that the construction subsector continues to encounter serious hazards, risks and accidents during all project phases despite the efforts of contractors to integrate health and safety (H&S) [12]. The risks manifested as asbestos and disinfectants, referred to as chemical risks, and radiation and noise, referred to as physical risks. Additional risks include bad posture at work, unpredictable work schedules with nights and shifts or rotations, lifting heavy equipment, irregular workdays, and workplace violence like harassment [9]. Other hazards may include inappropriate workplace design, ill-structured jobs, mismatch between job demands and worker's abilities, adverse environments, poor human-machine system design, and inappropriate management programs. These factors lead to workplace hazards, poor employee health, mechanical hardware injuries, and disabilities, which reduce the worker productivity and work/product quality and increase the cost [6]. Despite the construction industry's development, socioeconomic significance, and related regulatory framework, worker fatalities and illnesses at construction sites remain common and dangerous. There is a chance that these mishaps will cause serious injuries, irreversible bodily deformities, or even death. Such an event has an adverse effect on the country's economy since it reduces the number of people in the labor force, lowers productivity, and impairs overall job performance [9]. To this end, this study deems to investigate the safe acts implemented by the building contractors in the Ghanaian construction industry to suggest ways to boost safety performance aim at improving worker safety, and increase productivity.

## Literature Review

### Definition of safety performance in construction

Safety performance is a critical aspect of construction management, particularly in Ghana where the construction industry is a significant contributor to economic growth. Safety performance in construction is conceptualized as the degree to which construction firms adhere to regulatory standards and implement proactive measures to prevent accidents, injuries, and fatalities [9]. It can also be defined as the effectiveness of a construction firm's safety management practices in minimizing the occurrence and severity of workplace incidents. This definition emphasizes both compliance with established regulations and proactive risk management practices. According to [13] health and safety performance is "a measure of the level of effectiveness of those business activities aimed at the prevention of injury and disease to persons in the workplace." Safety concept seeks to maintain workplace safety through varied planned interventions. A good safety performance does not depend on reactive but proactive approaches [14]. They indicated that reactive methods become necessary when proactive strategies fail to produce the needed results. Safety improvement is not an overnight event; it thrives on good safety practices [14].

### Factors influencing safety performance

Like many other developing countries, Ghana's construction is marked by poor performance [15];[16];[17]. Like other low-income countries the construction sector has a higher accident rate than many other economic sectors. Contractors in developing countries particularly the indigenous ones face numerous constraints which could hamper the effective management of H&S, if not taken into consideration. The following variables have been identified by [18]; [1]; [20]; as potentially influencing the H&S management of building sites in developing nations: Inadequate infrastructure; communication issues stemming from low literacy; unregulated construction site procedures; adherence to conventional working methods; lack of equipment availability; inadequate site security; severe weather conditions; inappropriate equipment utilization; and corruption; lack of skilled and educated workforce; reliance on labor intensive methods, lack of single regulatory authority, huge informal sector participation and proliferation of small contractors, dominance of traditional procurement system, reliance on temporary workforce, colonial influence and fragmentation within the industry. However, the study by [1] identifies the lack of skilled and educated workforce, reliance on labor intensive methods and lack of single regulatory authority as the top three characteristics that have the highest negative influence on H&S performance of the industry. Effective health and safety management in developing nations is hampered by low literacy, according to [19]. management and supervisors are still not effectively emphasising the need for safety measures to be integrated in the accomplishment of different project activities [22]. According to [22], Ghanaian construction industry management become only reactionary by responding and addressing H&S issues, and so the analysis and sensing of the likely safety issues are ignored by management. Contrary, the study by [21] demonstrated fair H&S management practices on site. It finds that, construction sites in Ghana have policies for H&S delivery, provision for education and training of workers, provision for checking hazard and risk, do investigate and report accidents/ incidences promptly, do ensure good H&S information flow, strictly enforce H&S rules Health and safety management and regulations and prohibit alcoholism and drug abuse, reward for the avoidance and reduction of accidents and illnesses, good H&S behaviour and provision for insurance and hospital claims. Most of the construction sites adopt either one or a combination of mandatory H&S standards (ILO, NEBOSH, ISO, IFC, EU and others), do self-auditing and evaluation of H&S periodically and so on. Disciplinary actions are taken against offenders.

However, the above discovered factors could be improved by training and education. Unskilled, uneducated and untrained workers on the construction site can easily cause accidents, because this group of workers are often difficult to persuade on matters relating to H&S [1]. Hence, there is the need to train these unskilled construction workers in Ghana in order to provide them with the necessary skills required for efficient and safe performance at construction sites [1]. Consequently, it is recommended that anyone who wishes to work in the construction industry in Ghana must have some level of certification issued by authorized agencies, which will attest to their level of skills and competencies to execute tasks effectively and safely [1]; [18]; [20]. The reliance on labour intensive methods in the construction industry in Ghana directly exposes many site workers to the risks associated with their tasks [1]. Many construction organisations mostly rely on labour-intensive methods because they do not have the requisite plants and equipment, as well as the technology to perform those tasks. While labour intensive construction methods create opportunities for a considerably larger number of unskilled and low-skilled jobs than if equipment-based methods were used, they also expose more workers to hazards, and this has resulted in the poor safety performance of the industry [18]; [1]; [20]. A single authority is important to ensure that activities of the industry are properly streamlined and regulated. It is advocated that this body must be instituted as a statutory authority backed by an Act of Parliament and be well-resourced to carry out its mandate. Following the examples of the Construction Industry Council (CIC) in Hong Kong and the Construction Industry Development Board (CIDB) in Malaysia and South Africa [20], Ghana can establish its statutory authority with a mandate to regulate the activities of the construction industry and to ensure its continuous improvement in all areas including H&S. Ghanaian construction contractors are putting H&S programs in place to help improve the state of H&S in the industry [22]. Thus, most Ghanaian contractors have H&S policies and code of conduct in place to help direct their H&S implementation in the industry. Project Managers also have direct impact on safety performance by ensuring safety standards are adhered to, providing appropriate H&S budget at the beginning of the project [12]. Current study by [20] on factors influence H&S performance in Ghanaian construction firms discovered that, safeguarding the health and safety of artisans is the surest means of sustaining the building construction industry as the successful delivery of projects is greatly dependent on artisans.

## Previous research on safety performance in construction firms

Researchers on H&S management, and safety performance in Ghanaian construction industry is mostly concentrated on the management practices considering factors such as Inadequate infrastructure; communication issues stemming from low literacy; unregulated construction site procedures; adherence to conventional working methods; lack of equipment availability; inadequate site security; severe weather conditions; inappropriate equipment utilization; and corruption. Effective health and safety management in developing nations is hampered by low literacy, rather the actions of the workers on site. This could be viewed in the studies by [18];[20];[21]. This study is unique hence, considers safe acts and conditions as a measure of safety performance of construction firms in Ghana.

## Methodology

The research aims to investigate the safety performance of building contractors in Ghanaian construction firms in Ghana hence, a quantitative research methodology was used. This approach is grounded in the positivist/objectivist philosophical paradigm and follows a logical deductive process. The study's philosophical stances led to the adoption of the quantitative research methodology. This method was chosen because, according to [23], a study is considered quantitative if the analyses of its data is using descriptive statistical tools. This is why, in

contrast to qualitative research that uses textual and thematic analysis, the current study was conducted using quantitative methods [24].

The Association of Building and Civil Engineering Contractors of Ghana (ABCECG) served as the study unit of analysis. Therefore, the population consisted of all the enterprises that were involved. The study population consisted of all building contractors in the ABCECG in Ghana. Thus, only recorded membership and paid-up lists of the ABCECG were considered. The ABCECG is the authority body for both civil and building construction firms in Ghana, which monitors the daily undertakings of its members. According to [25], there are 653 building contractors under the ABCECG in Ghana. Since it was not possible to include all of these contractors in the current study, it was wise to choose a sample that would be representative of the whole population. This information was used to calculate the sample size for this study using Yamane's (1967) formula. Since the formula is effective when used with the random sampling technique, it was chosen. The following is the formula:

where:

$n$  =the sample size;

$N$  =the population size;

and  $e$ = the level of precision (0.05).

A confidence level of 95% and  $p= 0.5$  degrees of variability were assumed for the equation.

Based on the equation, the sample size was determined as follows:

To request data from respondents, research was conducted using the probability sampling where Simple Random Sampling was employed. In simple random sampling, every individual in the population has an equal chance of being selected. This method can be achieved using random number generators or drawing lots. In this process, the questionnaires were distributed to the various building contractor's, exposing all of them to the chance of taking part in this study. The professionals were contacted to obtain the necessary information to help them achieve the research aim.

A questionnaire was used as the data collection tool using a survey strategy. The adoption of the close-ended questions made it easier for the responses to be coded and analyzed systematically [26]. It also made it easier for the researcher to collect the data within a short period of time. In this study, the questionnaire was prepared by reviewing literature to gather safe acts and conditions on construction activities. This formed the variables for this survey. Designed questions were first pilot to test the validity of the variables. It is the best practice in a survey-based construction management research to use an odd-number of experts during the pilot review [27]. Where the experts have different opinions regarding the relevance of the any variable, the dominant view is adopted. In this case, five experts were adopted and the outcome resulted in the approval of all the 21 out of 26 variables. The 5 variables that were disproved were deleted. The existed list formed the basis for data collection. The final questionnaire was used to create an online survey link using 'Google Form'. The researcher combined MS word and outlook to write a personalised message invitation email (with the google form link attached) to all the 653 firms. These data collection techniques were employed because of the reason that questionnaires can be sent to all the respondents within a fraction of time in a cost-effective manner.

The study ensured informed consent obtained from participants. They may need full information about the research including the reasons they have been chosen to participate. Participants' privacy, confidentiality and anonymity were guaranteed. Consent forms and a covering letter were provided during questionnaire distribution. Finally, the respective respondents were assured that the study findings were used appropriately and at the same time a copy of the final conclusion was provided for them. Experts were given 2 weeks to complete the online

survey. The respondents basically ticked the appropriate answers after reading the questions and with the response choices given; there was no need to further explain the questions to the respondents. All questions on the google form were made “required” to ensure that all items are responded by respondents. Data gathered from respondents through the use of questionnaire was first of all edited before they are coded into statistical package for social science (SPSS). Respondents’ responses were assigned numerical values and this made it easier for the researcher to work on the close ended question items.

After coding of the data, mean score ranking was used to analyzed the data. The Mean, and standard deviations were computed. Results were then being presented using tables. Tables effectively order and summarize the quantitative data. They are used to arrange data in columns and rows. These data can be systematically examined.

## Presentation and Discussion of Findings

Pretesting was necessary also the data was collected to ensure that questions were fully conveying their intended meaning [28]. The Cronbach’s alpha was used to assess the reliability.

**Table 1: Reliability of the data**

Reliability Statistics	
Cronbach’s Alpha	N of Items
0.969	22

For a scale to be considered reliable its Cronbach Alpha coefficient should exceed 0.700 [29]. From table 1 above, the Cronbach alpha of 0.969 which exceeds the reliability requirement. To this end, the scale used in this study is reliable.

Respondents for the study were asked in this section to rank following safe acts on a Likert scale of 1 to 5 where 1= Very low, 2= Low, 3= Moderate, 4= High and 5= Very high. From table 2 below, the first column, consist of the safe acts to which construction companies should consider. The second column demonstrate the number of responses to each safe act listed. The next column has the mean score of each safe act, and the next to it has the standard deviation to each of the acts. The last column shows the ranking of each safe act as demonstrated by the respondents. To this end, the first ranked variable by the respondents is the Ensuring that construction sites are secure to prevent unauthorized access and vandalism with a mean score of 3.58 and a standard deviation of 1.121, and ensuring that scaffolding is erected, inspected, and used safely to prevent falls and accidents had the second position with score of 3.48 and standard deviation of 1.155. This could be followed on the table 2 below. In a situation where the means of different variables are the same, the variable with the lower standard deviation was ranked higher.

**Table 2: Mean Score and Standard Deviation Ranking**

<b>Mean Score Ranking</b>				
<b>Safe Acts</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Ranking</b>
Ensuring that construction sites are secure to prevent unauthorized access and vandalism	252	3.58	1.121	1 <sup>th</sup>
Ensuring that scaffolding is erected, inspected, and used safely to prevent falls and accidents	252	3.48	1.155	2 <sup>nd</sup>
Safely handling electrical equipment and following proper procedures for working with electricity	252	3.40	1.134	3 <sup>d</sup>
Keeping the worksite clean and organized to prevent tripping hazards and improve overall safety	252	3.39	1.010	4 <sup>th</sup>
Wearing of Personal Protective Equipment	252	3.34	1.038	5 <sup>th</sup>
Adhering to environmental regulations and guidelines to protect the environment	252	3.33	1.129	6 <sup>th</sup>
Knowing the location of first aid kits, fire extinguishers, and emergency exits and understanding how to use them	252	3.32	1.127	7 <sup>th</sup>
Following safety protocols when handling asbestos-containing materials to prevent exposure	252	3.30	1.084	8 <sup>th</sup>
Safely storing, handling, and transporting construction materials to prevent accidents	252	3.29	1.060	9 <sup>th</sup>
Paying attention to safety signs and labels that indicate potential hazards and safe practices	252	3.28	1.172	10 <sup>th</sup>
Using appropriate respiratory protection when working with hazardous materials or in dusty environments	252	3.24	1.154	11 <sup>th</sup>
Using tools correctly and maintaining them in low working condition to prevent accidents	252	3.22	1.139	12 <sup>th</sup>
Knowing how to prevent fires and how to respond in case of a fire emergency	252	3.21	1.174	13 <sup>th</sup>
Implementing proper traffic control measures to protect workers and the public in construction areas near roads	252	3.20	1.158	14 <sup>th</sup>
Effective communication among workers to ensure everyone is aware of potential hazards and can work together safely	252	3.20	1.119	15 <sup>th</sup>
Using of fall protection equipment such as safety harnesses, guardrails, or safety nets	252	3.18	1.199	16 <sup>th</sup>
Training workers in proper lifting techniques to reduce the risk of musculoskeletal injuries	252	3.10	1.200	17 <sup>th</sup>
Following specific procedures and safety measures when working in confined spaces	252	3.09	1.141	18 <sup>th</sup>

Giving construction workers safety training	252	3.04	1.156	19 <sup>th</sup>
Horseplay	252	2.97	1.169	20 <sup>th</sup>
Regularly inspecting and maintaining construction equipment to ensure it is in safe working order	252	2.85	1.226	21 <sup>th</sup>
Using alcohol and drug at worksite	252	2.64	1.297	22 <sup>nd</sup>
Valid N (listwise)	252			

### (Field Data 2023)

The above table 2, has a tall list of safe acts or conditions that construction companies are expected to implement to ensure safety in carrying out their duties to boost their performance. The findings from this study shows that these safety measures are hardly ensured in our Ghanaian companies. This is realized from the mean scores of the various variables. Using a hypothesized mean of 3.50, means that, only Ensuring that construction sites are secure to prevent unauthorized access had it mean score higher/equal to the hypothesized mean. This means that, this is the only safe act Ghanaian construction companies pay attention to as a measure to improve safety in their sites. Securing construction sites to prevent unauthorized access and vandalism is a crucial aspect of ensuring health and safety in the construction industry. [30] emphasized the importance of site security measures as a proactive step toward mitigating risks and creating a safe working environment. Unauthorized access to construction sites poses significant risks to both personnel and the project itself. [31] highlights the potential for accidents, theft, and vandalism when unauthorized individuals enter construction sites. [32] emphasize that restricting access is fundamental to preventing accidents, injuries, and damage to property. Unauthorized access increases the risk of injury to workers. [33] points out that individuals unfamiliar with construction site hazards may inadvertently put themselves and others at risk. Secure sites contribute to a controlled environment where only authorized personnel, who are trained to navigate construction hazards, are present. Construction sites in Ghana are subject to specific safety regulations that mandate measures to prevent unauthorized access and ensure worker safety. [34] emphasized the importance of compliance with regulatory frameworks to avoid legal consequences and promote a culture of safety.

Using tools correctly and maintaining them in good working condition is a critical aspect of promoting construction safety in Ghana. Proper tool usage and maintenance contribute to accident prevention, ensuring a safe working environment for construction personnel. [35] emphasizes the importance of selecting the right tools for specific tasks and providing adequate training to workers on their proper usage. Incorrect tool selection or lack of training can lead to accidents and injuries. A comprehensive training program should cover not only the correct use of tools but also safety protocols associated with each tool. Accidents resulting from improper tool use are a significant concern in the construction industry. [36] discusses the potential for injuries such as cuts, abrasions, and fractures when tools are not used correctly. Raising awareness about the risks associated with tool misuse and providing continuous training are effective strategies for accident prevention [37];[38]. Construction sites in Ghana should ensure that tools are used in accordance with established safety recommendations. [39] suggests that incorporating daily or pre-use inspections into the work routine promotes a culture of accountability and ensures that only safe tools are used on construction sites. Proper tool storage and organization contribute to safety by reducing the risk of accidents related to misplaced or poorly stored tools. An organized work environment enhances efficiency, minimizes the potential for accidents, and facilitates quick access to tools when needed [40].

Generally, improving construction safety performance in Ghana requires the implementation of safe acts and conditions throughout the project lifecycle. Adherence to safety regulations

and compliance with legal requirements is crucial for improving construction health and safety. Studies by [41] highlight that regulatory compliance not only reduces the risk of accidents but also contributes to the overall professionalism and reputation of the construction industry in Ghana. Open and effective communication is a cornerstone of construction safety. The proper use of Personal Protective Equipment (PPE) is crucial for mitigating the impact of hazards on workers. [42] emphasize the need for providing appropriate PPE, ensuring its correct use, and regularly inspecting and maintaining equipment.

## Conclusion and Recommendations

The study aimed to identify the safe acts implemented by the building contractors in the Ghanaian construction industry to suggest ways to boost safety performance. The study found out that, "Ensuring that construction sites are secure to prevent unauthorized access and vandalism" is the most common safe practice that the building contractors implement as safe act in the Ghanaian construction companies. The findings of this study revealed a disconcerting reality of moderate overall adherence to safety standards within the construction industry. The results underscore a critical need for urgent attention and intervention to address the significant shortcomings in ensuring the well-being of workers and the broader safety landscape. One of the key observations is the widespread inadequacy of basic health and safety measures across construction sites in Ghana. A substantial number of firms exhibit deficiencies in providing essential PPE, conducting regular safety training, and maintaining safe working conditions. This points to a systemic issue that demands immediate corrective actions to mitigate potential hazards and protect the health of workers.

The research therefore, provided a valuable insight into the safety performance of the Ghanaian construction industry, with a specific focus on secure construction sites and proper tool practices. The identified safe acts serve as foundational elements for creating a safer working environment. As the industry navigates challenges and embraces recommendations for continuous improvement, the implementation of these safe acts can contribute significantly to elevating H&S standards within the Ghanaian construction sector.

The primary practical significance of this study lies in the improvement of worker safety and well-being within the construction industry in Ghana. A poor level of safety implementation poses direct risks to the physical health and lives of workers. Addressing these shortcomings can result in a safer work environment, reducing the number of accidents and injuries. An extension of this study could conduct an in-depth evaluation of the effectiveness of health and safety training programs within construction firms. Moreover, a study to analyse the impact of different training methodologies, frequency of training sessions, and the use of immersive technologies in enhancing safety awareness and competence among workers, to identify the best practices in training delivery for optimal outcomes.

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