

Building Safety Regulations in The Construction of Housing Projects

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Abstract

Building safety regulation was become the main issue in the construction industry because of the increased rate of death and injury among workers in the workplace. This research aims to identify effective safety compliance towards the Occupational Safety and Health (OSHA) by developers and consultants to minimise the risk in the construction of housing projects. The objective is to explore the importance of building safety regulations in the construction of housing projects. The interview session has been conducted among developers and consultants in the construction industry, which are currently involved in construction of housing projects. All the data collected were examined utilising theme analytic techniques. The study has identified that there were six (6) themes of impacts with non-compliance with safety regulations, (1) Financial penalties, (2) Loss of productivity, (3) Damage to the end loss of materials, plant, and equipment, (4) Time loss, (5) Endangering lives and (6) Industry disqualification. This findings will be able to determine the effects of non-compliance with safety regulation requirements in the construction of housing projects.

1. Introduction

Across the globe, the construction sector has had a history of high occupational accident and death injury rates. For example, in 2018, the construction industry in the United States recorded 1.038 fatal workplace accidents, accounting for more than 19% of all occupational death in the country (Choi & Lee, 2022). The construction industry, according to the Occupational Safety and Health (OSHA), had the highest percentage of fatalities of any industry in the United States. Because of a lack of danger knowledge, of the fatal four falls, 60% of the fatalities were electrocutions, caught-in-between, and being struck by an object (Zeng & Yi Man Li, 2022). Even though laws have helped enforce safety such as the Occupational Safety and Health Act (OSHA) in the United States, the National Institute for Occupational Health (NIOH) in India, the Health and Safety Executive (HSE) in the United Kingdom, and the Labor Department in Hong Kong, the socio-economic impact of injury and fatality rates remains alarming (Akram et al., n.d.). Construction has traditionally and globally been considered to be one of the most hazardous industries, posing several problems and risks by its very nature, and the supply chain's fragmented nature, which includes a larger number of contractors and subcontractors, raises the risk profile of the company.

Poor OSHA performance resulted in the industry's having a particularly high number of deadly workplace accidents, and inadequate risk management has long-term health consequences (despite being difficult to monitor due to the sector's cyclical nature) (Blanc et al., 2022).

Ebekeozien (2021) stated that this is due to the insufficient safety measures in the sector, which result in an accident and increase the cost of the organization's management a lot (direct or indirect cost). According to the South African Department of Labor figures, the cost claims resulting from fatalities, injuries, and occupational sickness on construction sites exceeded 2 billion per year (Amoah & Simpeh, 2021). Accidents cause not only bodily harm to workers but also financial harm because they lose a major portion of their pay due to inability to work and absenteeism. The decrease in productivity is a direct effect of workplace accidents, which impact worker efficiency, resulting in a drop in overall output from activities (Singh et al., 2022). This issue, provokes a remark on this research where the objective is to identify the effect of non-compliance to safety regulation requirements in the construction of housing projects.

2. Literature Review

According to Salguero-Caparrós et al. (2020), in Europe, it is up to the Labor Authorities to supervise how laws, rules, and regulations are changed to reflect evolving working requirements. The main problem that the majority of responders experienced was the site worker's lack of compliance. Non-compliance with safety regulations has an effect:

2.1 Financial Penalties

In the USA, direct workers' compensation expenditures were anticipated to reach \$48.6 billion (Haupt & Pillay, 2016). In addition to any OSHA fines, companies may also be subject to additional legal fees to resolve claims from injured workers. As a notorious case, the 2010 Deepwater Horizon oil rig explosion in the Gulf of Mexico and the ensuing environmental catastrophe have so far cost operator British Petroleum (BP) more than \$13 billion in claims, payments, and settlements.

2.2 Loss Productivities

(Umeokafor, 2018) stated that this is because H&S accidents have higher direct and indirect costs, which lower productivity. A major consequence of the accident is a loss in productivity, which is a problem for the majority of developing countries. Industries that have experienced accidents on the job site must deal with decreased productivity and reduced production rates, which cause projects to be delayed. For example, delays in road construction projects in the State of Perak.

2.3 Damage to end Loss of Materials, Plant and Equipment

While most accidents might result in both property damage and personal injuries, those accidents that resulted injuries were less likely to do so (Haupt & Pillay, 2016). No proper maintenance and cheaper fall protection equipment may fail at a higher rate than a more expensive body harness would, so responsibility for someone's personal injury is mitigated in the long term. Many have learned this the hard way.

2.4 Loss Time

According to the HSE, the construction industry in Britain has lost 1.7 million working days (Umeokafor, 2018). Labor Statistics estimates that 9 out of every 100 full-time construction workers will get a lost-time injury as a result of contact with objects or machinery. Overexertion-related injuries will cause by 4.5 out of 1,000 workers. Additionally, 2.5 out of 1,000 workers will miss work time as a result of a fall.

2.5 Endangering Lives

Construction workers face multiple dangers every time they go to work. Adinyira et al. (2020) have stated that employees are exposed to significant hazards since companies don't give them the support they need regarding safety procedures related to certain tasks. For example, accident in Petaling Jaya in which a worker was killed when an iron structure dangling from a crane fell on him at a construction site because there was no adequate management to identify potential safety hazards in the workplace before causing an accident.

2.6 Industry Qualification/ Damage Reputation

When a company's health and safety standards are exposed as deficient, clients, business partners, and the general public have a reason to view it negatively. Reputation damage can be serious and frequently requires years, if not always to repair. For examples, in Malaysia, case of light rail transit (LRT) construction site collapsed.

3. Methodology

The literature review is the data from secondary data. Secondary data is used when primary data is not accessible for the research, such as research articles by other researchers (journals). Articles published in the Scopus, Emerald Insight, Science Direct and Web of Science (WoS) were used. The range of years for the research articles that researcher used as secondary data was from 2016 to 2022. All the data collection or survey data's were examined through themes analytic technique. The collection data was divided into six (6) themes effects of non-compliance to safety regulation requirement in construction of housing projects as follow:

- Financial penalties (Haupt & Pillay, 2016), (Hamid et al., 2019)
- Loss productivity (Hasan et al., 2018), (Gurmu & Aibinu, 2018)
- Damage to end loss of materials, plant and equipment (Haupt & Pillay, 2016), (Bengtsson et al., 2022)
- Time loss/delayed (Oyegoke & Al Kiyumi, 2017), (Hoque et al., 2021)
- Endangering lives (Haupt & Pillay, 2016), (Adinyira et al., 2020)
- Industry disqualification or reputation damage (Baucus & Cochran, 2016), (Mariconda et al., 2019)

4. Results and Discussion

4.1 Industry Qualification/ Damage Reputation

The collected data in Section A describes the personnel of respondents that were gathered in the form of simple questions. This is where the data verified whether the respondents are qualified enough to be interview and answer the Regulation Safety-related questions to make it relevant, where the study set at least more than 2 years in the safety work have applicable feedback from experience respondents. The occupational information adapted to differentiate the level of education, different organisation, professions, experience, and size of project. All interviewed respondents are related to the research, which was selected based on the CIDB database. Thus, it varified that most of the respondents should have an experience on regulation safety and work in public listed company under G7, but the experience gained from years does not guarantee how fully their compliance toward safety regulations in the construction. An assumption was made based on the size of project that their handle and support from other readings. The interviewed respondents are mostly awarded, Bachelor's Degree. As research would have it, most of the respondents have an experience range from four (4) until above ten (10) years. As planned, personnel information was gained to contact to do an interview through a company, and then the company representative was contacted in application to proceed with the interview. Table 1.0 shows an interview divides into two (2) roles in construction- contractor, and consultant.

Table 1 Respondents background

RESPONDENT	NATURE OF BUSINESS	POSITION IN COMPANY	YEAR OF EXPERIENCE	SIZE OF PROJECT
Respondent 1	Consultant	Manager	4	More than 10 million
Respondent 2	Contractor	Project Assistant	7	More than 10 million
Respondent 3	Contractor	Contractor	5	400 million
Respondent 4	Contractor	Quantity Surveyor	11	More than 400 million
Respondent 5	Contractor	Assistant Manager Civil & Structure	12	400 million

4.2 The Importance of Building Safety Regulation in the Construction of Housing Projects

This section focuses on the importance of compliance with building safety regulations in the construction of housing projects. With a detailed question design coup with the objectives, it will correlate between each three (3) sub-questions in Section B. The interviews have given questions about the importance implement building safety regulations in the construction of housing projects. The questions were outlining the safety regulation compliance in the construction of housing projects to identify the common knowledge safety regulation in the

construction field among an interviewee. As shown in Table 2.0, there is a variety of acknowledgements regarding the topic. Nevertheless, the reply received from the interviewee is connected to the questions.

Table 2 *The importance of building safety regulation in the construction of housing projects*

QUESTION	RESPONDENT	RESPONSES
Do you believe consultants use all facets/ aspects of safety regulation in the construction industry?	<i>Respondent 1</i>	<i>"I'm sure. Because not all consultants are experienced in the field".</i>
	<i>Respondent 2</i>	<i>"No, because of the cost and the mindset. Some consultants believe that the best way to is to reduce or eliminate all facets of safety regulation".</i>
	<i>Respondent 3</i>	<i>"Yes. I believe the consultants use all facets of safety regulation in the construction industry to look for the danger that might escape the notice of management and staff. It helps to increase workers' safety."</i>
	<i>Respondent 4</i>	<i>"Yes. To avoid an accident on site."</i>
	<i>Respondent 5</i>	<i>"I believe that some companies, but not all, have implemented regulations. Some consultants have not fully implemented the safety regulations because the companies don't want to spend money on safety training, for example. I believe all consulting companies must implement it, as they're responsible for their employee's safety."</i>

Most of the respondents responded and give a straightforward reply to the safety regulation term with their experience and knowledge. An opinion is given to have a good measurement of the real situation during the application of assessment occur. It reflected how the respondents reacted to their proficiency in the construction industry. Thus, it proves all the respondents experienced the implementation of building safety regulations especially in the construction of housing projects. The provided responses connected to fundamental assessment must prevent any misunderstandings about the study topic. Although the responses are relevant to the study, it is important to note that this does not necessarily mean that the respondent completely comprehends the seriousness of the questions. It can be seen in respondents 1 and 4. Regardless of the statement given, it doesn't satisfy the question as it said "because not all construction is experienced in the field". For sure the respondent mentions the common reason that non-compliance with safety regulation but did not mention the detailed effect on the construction industry. The overall answer can be contributed to the research.

4.3 Factors Leading to Weakness Implementation of Building Safety Regulation

The data revealed that there are a few factors that lead to the weak implementation of building safety regulations in the construction industry. There is poor project management/leadership, which is seen as a major factor that contributed to weak implementation of safety regulation. Shu and Zhang, (2022) discovered that in the hospitality sector, supervisor's transformational leadership is positively correlated with employees' behaviors, demonstrating that employees' perceptions of transformational leadership might influence their self-reported safety behavior. The respondents demonstrated a shared knowledge of the major factors that lead to weak implementation of building safety regulation through the culture of learning. Overall, a few respondents working in the construction industry were more engaged in different experiences related to safety regulations, especially people who worked in an office.

Another factor that contributes to the weak implementation of building safety regulations, from the perspective of the respondents, is the poor behavior of workers in compliance with safety regulations implemented to ensure safety in the workplace. Respondent 1 believe that if worker not wearing safety equipment such as safety helmet and shoes it is one poor behavior that worker show on site. It because in managing worker safety behavior, holding regular OSHA meetings is seen as important as a preventative approach to accidents. As we know health, safety, and well-being of employees are their responsibility. Employers are trained by organizations on the site, but there are always going to be that who disregard health and safety procedures and take risks. Due to the possibility of making decisions with unfavourable outcomes, human behaviour contributes significantly to all accidents, especially serious ones. Meanwhile, a lack of safety training among workers also was

the other factor leading to weakness implementation of safety regulation. From the observation, all the interviewees gave the responses that fully agreed with the questions about the related safety training with the implementation of safety regulations. Safety training for workers before involved with construction was important to prevent any accidents in the workplace related to safety. Through that construction firms need to increase their workers' ownership for safety by offering safety training that takes into account the particulars of the workplace culture and incorporates tacit knowledge exchange. As shown in Table 3.0, there are variety of responses regarding a lack of safety training that influence the implementation of safety regulation.

Table 3 *Lack of safety training influence the implementation*

QUESTIONS	RESPONDENT	RESPONSES
Does a lack of workers' training influence the implementation of safety regulations?	<i>Respondent 1</i>	<i>"Yes. They think it's minor and doesn't lead to big/several problems."</i>
	<i>Respondent 2</i>	<i>"Yes. Worker safety training is an important thing in construction. This is because training can reduce the risk of accidents in the workplace. The training can enhance the worker's skill in machine handling and their respective job."</i>
	<i>Respondent 3</i>	<i>"Yes. It is because safety and health training are very important to reduce accidents at work. If a company does not care about this. I am sure various accidents are likely to occur frequently because all employees do not have awareness of occupational safety and health."</i>
	<i>Respondent 4</i>	<i>"Yes, because it is the most important way to avoid accidents on-site. If the workers themselves, the one that was supposed to be working on-site every single day, were not equipped with proper safety training, then they will be more exposed to dangers and unwanted accidents."</i>
	<i>Respondent 5</i>	<i>"Yes. It helps employees understand safety regulations at the workplace and minimize the severity of hazards to occur."</i>

4.4 The Effect of Non-Compliance with Building Safety Regulation Requirements in the Construction of Housing Projects

The interviewees talked about the effects of non-compliance to building safety regulation requirement in the construction industry. The five (5) sub-questions in Section D will correlate with each other to a detailed question design that matches the objective. Overall, both contractors and consultants acknowledge that the worst effect of non-compliance with safety regulations was endangering the lives of workers. Even the other study already stated a few effects such as financial penalties, delays, damage to reputation, loss of productivity, and others, but endangering life become an issue in the construction industry related to safety. Based on observation, all interviewees agreed with the question included in the interview. As shown in Table 4.0, there is the reply received from the interviewee regarding the worst effects of non-compliance to safety regulations.

Table 4 *The effect of non-compliance with building safety regulation requirements in the construction*

QUESTION	RESPONDENT	RESPONSES
Is endangering lives is being the worse effect of non-compliance to building safety regulations in the construction industry?	<i>Respondent 1</i>	<i>"Yes. This is because regulations are very important in the construction sector."</i>
	<i>Respondent 2</i>	<i>"Yes. This is about life. Once an accident happened, there will be an injury or sometime there will be death. When it's come to injuries, there will n effects on future life such as unable to work due to paralysis, loss of limbs, and others. Death, some worker has their family, their death will have a huge impact on them as family member lose a place to depend on."</i>
	<i>Respondent 3</i>	<i>"Yes, very dangerous. It is because if the matter is not taken seriously. I am sure there will be many workers who do not want to work under the construction company because their lives are not worth the company."</i>
	<i>Respondent 4</i>	<i>"Yes. I think because if accidents were to happen on construction sites, the workers will be exposed to fatality as the construction industry is one of the most dangerous industries."</i>
	<i>Respondent 5</i>	<i>Yes. If the construction site is dangerous and involves a loss of employees' life, it may also involve the lives of the public in the future."</i>

According to Table 4.0, there are responses from all respondents that correlate with the topic of research. Overall, all interviewees responded with a fully acknowledge that workers' safety in the construction industry without the safety regulation will affect their life. The respondents mentioned that the worst outcome is when a worker dies. Since the construction sector continues to have one of the highest rates of work-related fatalities, preventing serious accidents and injuries was of the highest concern. An opinion is given to have a good measurement of the real situation of death that will occur during the construction of housing projects. Thus, this proves all the respondents are aware of the consequences of workers' non-compliance with building safety regulations. Having said that, overall the answer from the interview can be contributed to the research on the importance of building safety regulations in the construction of housing projects.

5. Conclusion

Based on the findings presented, reveals that there are many benefits of compliance with building safety regulation requirement in the construction of housing projects, which can bring peace among the public and workers. The study reveals the consequence of workers' negligence of safety regulations that have been implemented in the workplace. The findings can be a basis for understanding the most serious effects of non-compliance with safety regulation requirement in construction was financial penalties and loss of productivity.

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception, and design:** Nur hidayah Rais, Nurul Asra Abd Rahman; **data collection:** Nur Hidayah Rais; **analysis and interpretation of results:** Nur Hidayah Rais, Nurul Asra Abd Rahman; **draft manuscript preparation:** Nurul Asra Abd Rahman, Zarina Alias, Zainab Mohmad Zainordin, Suryani Ahmad. All authors reviewed the results and approved the final version of the manuscript.

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