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Civil Engineering

**A CRITICAL ASSESSMENT OF HEALTH
AND SAFETY REGULATIONS AND
TRAININGS IN THE CONSTRUCTION
INDUSTRY OF PAKISTAN**

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Master's Thesis

Supervisor

Assoc. Prof. Dr. Aykut ERKAL

İstanbul, 2024

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The thesis titled “A critical assessment of Health and Safety regulations and trainings in the CI The thesis titled A CRITICAL ASSESSMENT OF HEALTH AND SAFETY REGULATIONS AND TRAININGS IN THE CONSTRUCTION INDUSTRY OF PAKISTAN prepared by KHAWAJA AHMED WAHAJ WANI and submitted on 17/1/24 has been accepted **unanimously** for degree of Master of Science in Civil Engineering.

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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Signature



DEDICATION

Firstly, I would like to appreciate my parents hard work and honesty during my upbringing because it is due to their dedication to me that I was able to view life in a positive light. My father's commitment to his work and my mother commitment to being a good wife and a mother was such a positive environment that it gradually led to my development of a sensitive emotion in my nature. All the work I have done is for one simple goal which is that I feel that it is important for us change the methods of construction in my beloved country Pakistan. We have already lost so much in the era of terror over the years, so now it is necessary that we start thinking seriously about the condition of health and safety practices in our country. That is the primary aim of all the efforts I have made for the purpose of my thesis. Due to this, I am going to dedicate my life to improving the approach towards health and safety.

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Firstly, I would like to thank my parents, who gave me strength throughout all the hard times. Moreover, I would like to thank my supervisor Assoc. Dr. Aykut Erkal, for his endless guidance, valuable time, and encouragement to complete my research work. I am also extremely grateful to the committee members. I also owe my special thanks to the respondents for their valuable contribution to this research. In the end, I pay my earnest gratitude with sincere sense of respect to my parents and family for unending support, encouragement, and patience.



ABSTRACT

A CRITICAL ASSESSMENT OF HEALTH AND SAFETY REGULATIONS AND TRAININGS IN THE CONSTRUCTION INDUSTRY OF PAKISTAN

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[Construction Industry holds significance position with respect to its prominent impact on workers' Occupational Safety and Health (OSH). Pakistan's construction industry has witnessed a prominent growth in its activities. Regardless of its rapid expansion, Pakistan's construction sector continues to suffer from dangerous working conditions because of legislative gaps or other flaws. There are various reasons behind the increased rate of fatality and injuries at worksites including but not limited to unhealthy construction activities, uncertain site conditions, and hazardous working environment. The purpose of this research is to investigate the health and safety practices in the construction industry of Pakistan. The main methods for collecting and generating research data are the questionnaire survey and interviews. This research work is conducted as an exclusive investigative study to evaluate the current standards of H&S being used in construction Industry of Pakistan and based on findings developed some remedial measures to improve the quality of construction sites. This survey involves all CI stakeholders, including clients, consultants, and contractors and subcontractors. The questionnaire is distributed among only between PEC registered companies. 76 of the 100 questionnaires that were sent are answered. In order to evaluate the degree of safety performance of CI of Pakistan, sixty safety procedures were examined using SPSS-18. Data was gathered from construction firms that are PEC registered and engaged in 54 different projects throughout different provinces in Pakistan. For additional examination, the data's high Cronbach's Coefficient Alpha value (0.958) demonstrated its

high reliability. The non-parametric test is used to assess the differences in perceptions of all stakeholders on the degree of safety performance in the CI of Pakistan after the Shapiro Wilk normality test revealed that the data was not normally distributed. The safety factor of "Using Hoists & Cranes," followed by "Precautionary Measures (Shoring & Excavation)," shows a higher performance level. The factor "Trainings on Safety" has the lowest degree of safety performance, followed by "Safety in the Contract Documentation," "Meetings for Safety," and "Worker Participation," in that order. This research study is the latest of its class to assess the present condition of construction safety measures in Pakistan. It will undoubtedly benefit CI stakeholders in identifying flaws in their safety measures.]

Keywords: Health and Safety Practices, CI of Pakistan, H&S Evaluation, Occupational H&S, Safety Assessment, PEC.

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LIST OF ABBREVIATIONS

CI	:	Construction Industry
SP	:	Safety Practices
SF	:	Safety Factors
SPI	:	Safety Practice Index
H&S	:	Health and Safety
OH&S	:	Occupational Health and Safety



LIST OF SYMBOLS

W : Weighting Assigned to Every Factor of Range 1-5 By Respondents



1. INTRODUCTION AND PURPOSE

1.1 INTRODUCTION TO RESEARCH

The construction industry links hundreds of different small and large industries which stimulates economic activity [1]. It holds significance in regard to its prominent impact on workers' Occupational Safety and Health (OSH) and the construction worker are more exposed to the risk of health and occupational risk. Pakistan's construction industry has witnessed a prominent growth in its activities and spreading further at a positive pace. Regardless of its rapid expansion, Pakistan's construction sector continues to suffer from dangerous working conditions because of legislative gaps or other flaws. An economy's backbone is usually represented by the building industry in that nation. With 2.5–10 times as many workers per milestone, the construction industry in underdeveloped nations like Pakistan uses more manpower than in industrialized nations. The primary goal of this proposed research project is to examine, evaluate, and recommend the best approaches to problem-solving so that construction firms would comply health and safety laws and regulations on building sites.

1.2 BACKGROUND OF STUDY

It has been determined, in the context of the research done by [5], that poor quality and protection practices had a detrimental effect on the health and safety of the low-wage labour force in the building projects. As per previous studies in the domain of health and safety measures in the construction industry of Pakistan, Multiple existing policies, and instructions from concerned regulatory authorities are present, but unfortunately there is no implementation of it on any scale.

Pakistan, a third world nation, is significantly behind industrialized countries in enforcing such efficient methods and steps to reduce deaths and damages at building sites. Key figures in Pakistan are primarily concerned with lowering building costs, enhancing the standard of the work, and cutting down on construction time. Although, the site and workers' safety is their lowest priority. As a result, the stakeholders in Pakistan's building sector have adopted unbalanced strategies, which have increased the number of poor labourer fatalities and injuries [4].

1.3 AIMS AND OBJECTIVES OF THE STUDY

The purpose of this research is to investigate the health and safety practices in the construction industry of Pakistan. In order to achieve the aim of the study, the following sub-objectives have been constructed;

- a. To understand the importance of health and safety.
- b. To determine the factors that contribute to the prevalent negligence of health and safety in CI of Pakistan.
- c. To evaluate the impact of neglected health and safety practices in CI of Pakistan.
- d. To offer suggestions for addressing the problem of ignored health and safety precautions in the CI of Pakistan.

1.4 RESEARCH QUESTIONS

To gain a thorough understanding of the concept of health and safety practices, the following set of research questions has been designed in this regard:

- a. What is the importance of health and safety in the construction industry of Pakistan?
- b. What are factors that contribute to the prevalent negligence of health and safety in CI of Pakistan?
- c. What is the impact of neglected health and safety practices in CI of Pakistan?
- d. What are the recommendations for coping with the issue of neglected health and safety measures in the construction industry of Pakistan?

Therefore, this research focuses on undertaking an investigation of the health and safety practices in Pakistan based on which practical implications and recommendations for the construction companies, regulatory authorities and insurance companies can be provided.

2. LITERATURE REVIEW

2.1 SIGNIFICANCE OF H&S IN THE CONSTRUCTION INDUSTRY

Construction safety is the discipline of conserving the health of those who construct, perform, sustain, and demolish engineering works, in addition to those affected by such works [8]. Whereas safety is a method for preventing the accident from happening. The goal of an efficient safety system is to eliminate and/or minimize the incidence of workplace accidents and hazards [9]; [10]. The majority of academics feel that there are still unresolved definitional, criterion, and measurement issues with relation to sustainability's urban component. The concept of sustainable development clearly places a primary emphasis on people, however the meaning of sustainability in urban environments needs considerably more elaboration. The CI with the highest labour force has contributed for approximately 11% of all work - related injuries and 20% of all workplace deaths [11]. According to ILO figures from 2005, one in every six fatal work - related accidents happens on construction sites. According to studies, hazards may be managed, and accidents can be avoided by implementing fundamental safety principles that lead to a solid safety system [12]. Workplace safety is a complicated problem, and perceptions and safety performance in CI are even more [13]. Furthermore, rules or regulations alone cannot ensure safety, nor should safety be the entire responsibility of the company, employees must be involved [14]. As a result, we may establish that safety is a shared commitment that involves education and training.

According to [13], the advantages of establishing an efficient and systematic safety, health and environmental (SH&E) system management include:

- a. Reducing the percentage of accidents to construction workers and employees through risk management and preventative measures.
- b. Reducing the possibility of deadly injuries
- c. Minimizing construction site threats in order to boost productivity.
- d. Lowering the expense of insurance and the cost of staff absence
- e. Reducing the legal expenses of incidents, lawsuits, penalties, and emergency supplies.
- f. Reducing incident reporting time, redirecting supervisors' time, administrative efforts, and loss of knowledge and experience.

2.1.1 Construction Industry in Pakistan

The government of Pakistan is bringing up new ideas, policies, and new business setups. Construction is considered the main core of the country's economy. The growth in this sector has opened doors for innovations, and with that, unfortunately, it has increased the rate of injuries and fatalities [15]. The construction industry of any country is a very complex sector of the country's economy, which includes a broad range of stakeholders and has a wide range of linkage with different areas of activity like finance, materials, and manufacturing. Constructions, industries, and companies are considered the backbone of an organization. This industry makes a substantial contribution to socioeconomic employment and growth. However, there is still agreement on several widespread issues that affect the construction industry in developing nations.

One of the dangerous industries in the world is Construction Industry. It is one of the Pakistan's fastest growing industrial segments 11.30% rise in 2014. It is a fact which reflects the economic position of the construction industry [16]. Construction sites are full of various risks that could causes hundreds of thousands of injuries, accidents and even deaths each year. These worksites are loaded with heavy equipment and machines, hazardous chemical, explosives, and other unsafe factors, all of which can cause injuries or even death. Environmental risks are affected by contamination as a result of construction work such as exposure to high level of noise, smoke, dust, vibrations, potential energy and site wastes. Construction work of the sky scrapper includes the exposure of toxic fumes, dust particles and other work risks [17].

Compared to workers in other industries, construction workers have a higher risk of workplace injuries, accidents, and deaths, and one of every five workplace casualties includes a construction worker [18]. Zahoor et al. [19], reported that there are laws and regulation on construction sites in most developed countries that lead to reduce or mitigate the health and safety threats. In order to provide a minimal level of safety at the workplace, compliance with safety mandates that workers take essential health & safety precautions, such as using personal protective equipment and sticking to health and safety standards with workplace safety rules. Zahoor et al. [19], reported that construction sites are perceived to be high-risk accident-prone areas and pose a great deal of health and safety issues. These problems can emerge from nearby activities, such as construction techniques, movement of

heavy machinery etc. Kim et al [20], concluded that construction sites are unfortunate to be wounded by fires, blasts and falls from height or scaffolding. Health and safety management is expected to take into account of all hazards, risks and accidents that may possibly be expected to place project workers at risk. It is extremely important for the health and safety of the workers to reduce or mitigate these risks, legally and ethically.

Pakistan's building sector is underdeveloped. As a result, it is vulnerable to dangers such as loading and unloading, exposure to various toxins on the job site, etc. Literature has indicated that safety is a major issue for maintaining productivity and safeguarding employees' lives. Workers in the construction industry require a safe and healthy environment for themselves and others who may be impacted by their work [21]. The scale of the construction business, security regulations, economic pressure, project planning, management training, and safety culture are just a few of the variables that have been identified as influencing safety effectiveness in the construction sector [22].

The covid-19 pandemic did not help the construction sector of Pakistan [23]. It exacerbated several weaknesses in the construction industry of Pakistan. Currently, the government has restricted the activities, but in the middle of 2020, the government allowed the industry to resume its operations. Moreover, the construction industry is expected to expand by around 3% in 2021. In the previous year, the sector suffered a decline of around 6%. The country is having a good time in the industry with large-scale projects underway. These large-scale projects are helping in developing the country and have the potential to lead the construction industry to high international standards [24].

2.1.2 Current Situation of Health & Safety Standards in Construction Industry of Pakistan

The main laws governing occupational health and safety in Pakistan are the 'Factories Act 1934 (Chapter 3)' and the 'Government of Pakistan Labour Policy 2010', which contain special provisions to regulate working conditions in all occupations but are unfortunately not enforced in full due to the negligence of Government agencies and workers' ignorance of their rights. Various researchers have done research and efforts have been made globally to study safety performances in Construction Industry [27]; [28]; [29]; [30]; [31]; [32]; [33]; [34]; [35]. Therefore, safety systems have been implemented to prevent accidents and

increase the performance of specific construction projects [36]; [37]. As of now, the main focus is to achieve zero accidents and target ultimate safety performance [38]. On most construction sites, safety standards are not followed, and there are no procedures for applying and overseeing these safety rules. Construction-related injuries and deaths are not the subject of any published data in Pakistan; hence it is impossible to compare safety procedures based on performance indicators.

There are about 39.40 million persons in Pakistan's labour force as a whole. According to the SBP annual report during 2010–2011, the CI contributed 2.5% of Pakistan's GDP and employed 6.29 percent of the country's labour force directly and 30–40 percent indirectly (Survey of Pakistan 2008). According to subjective information, the number of fatalities and injuries among construction workers in Pakistan may range from 20 to 25 percent [25]. Construction industry (CI) profitability and, to a certain extent, overall productivity are impacted negatively by construction accidents and the resulting harm to workers, property, and equipment. According to informal analyses, safety failures have generated dangerous project sites as well as construction delays, cost overruns, low productivity, and substandard services and products [25]. As a result, it is essential to develop a safety regulating authority, carry out health & safety awareness campaigns, and provide both formal and informal safety training and education for all concerned parties. The majority of clients also want high-quality services delivered quickly and affordably. The project's budget does not include a safety fund, and expenses are influenced by the required level of expertise, the difficulty of the project, and the terms of the agreement.

The key concern is that all safety regulating authorities are essentially incompetent, and contractors are not able to accurately record real injuries and fatalities [39]; [40]. Another significant issue in Pakistan's construction sector is cultural differences, which includes diversity in language, religion, and culture. One positive aspect of this cultural diversity is that Pakistan's construction industry offers employment opportunities across the nation. However, it generally compromises workplace safety [41]. Additionally, there is a need to alter the way that project owners, designers, and contractors think about implementing safety measures in CI. According to research [26], in order to improve their safety performance level, contractors in developing nations must implement management systems for safety.

Despite the fact that industrial safety has received significant attention, CI safety remains neglected. Figure 2.1 displays the information on industrial accidents in factories that is

currently available from Pakistan's labour division. According to a graph, there were 160 fatalities in 2007 compared to 30 in 2003. The necessity to create a regulatory body to enforce safety is justified by the increase in accident rate.

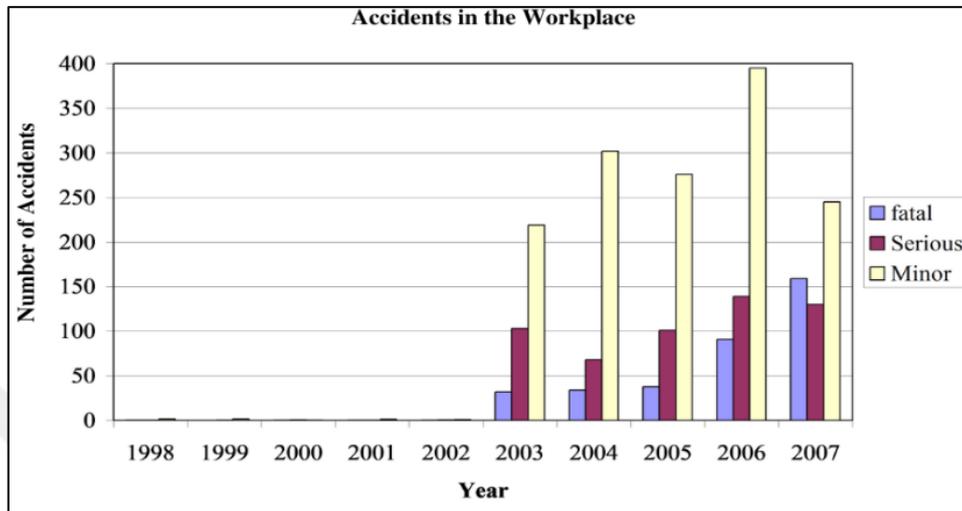


Figure 2.1: Number of Accidents in Industrial Workplace of Pakistan [42].

When it comes to their safety performance, major and small contractors vary significantly. The majority of large companies that are registered with PEC under category C-A (no restriction category), have a safety policy, offer some training to employees, and have safety officer on the workplace. Contrarily, smaller companies do not prioritize safety, which results in dangerous conditions on many sites and workers are exposed to various risks. In developed countries, engineers, architects, and other construction industry experts believed in the proper implementation of conferences and seminars valuable in keeping them informed about new techniques for building. But unfortunately, numerous sites lack training programs for the staff and employees; as a result, training for new staff or workers, the assessment of dangers, and safety briefings are not undertaken.

Employees must accept responsibility for their own errors and experience. On rural sites, it is also common to find an absence of medical services, poor hygiene, and low standard sanitation [25]. Despite the fact that industrial safety has received significant attention, CI safety remains neglected. Figure 2.1 displays the information on industrial accidents in factories that is currently available from Pakistan's labour division. According to a graph, there were 160 fatalities in 2007 compared to 30 in 2003. The necessity to create a regulatory body to enforce safety is justified by the increase in accident rate.

2.2 FACTORS CONTRIBUTING TO NEGLIGENCE AND CARELESSNESS IN THE EXECUTION OF H&S STANDARDS IN PAKISTANI CI FIRST SUBSECTION

The prevention of accidents is the key topic of construction safety. Several types of research were conducted to provide insights into the nature and causes of construction industry accidents. Some research listed the key causes of worker's death, while others established the main types of building accidents [43]. According to research work on 100 individual construction incidents.

Insufficient insurance mechanisms have failed to establish safety as an industry survival issue, and an undesirable business environment has resulted in aggressive business relationships among interested parties, leading to disputes, conflicts, assertions, and class actions, which has shifted the attention away from safety. These are just a few of the major reasons for safety non-performance. The study identified several important accident causes, including teamwork among employees (which accounted for 70% of accidents), workplace issues (49%), equipment shortfalls (including PPE) (56%), material suitability and site problems (27%), and risk management drawbacks (which accounted for 84%) [44].

Some of the major factors that are common in Construction sites of Pakistan, irrespective of the scale of construction firm that is assigned for the project, are listed below. Such factors clearly implies that due to lack of seriousness from concerned regulatory bodies, accidents and injuries are happening on regular basis.

- a. Accidents from cave-ins frequently happen when digging in deep trenches (without the required shoring or bracing).
- b. Since protective gloves and boots are rarely used when pouring concrete, cement burns frequently occur.
- c. Workers lose their balance because of substandard wooden scaffolding and a lack of safety belts, according to statistics.
- d. Workers suffer injuries to their face, head, fingers, eyes, and feet as a result of not wearing personal protection equipment.
- e. There is poor housekeeping and insufficient access to water for drinking and washing.

- f. Poor equipment maintenance and a lack of job knowledge are other significant factors which results in accidents.
- g. Most injuries go unreported, but, if necessary, a worker may receive first aid or basic medical care. Specialized medical care or compensation is typically not offered. Construction workers believe that accidents happen because they are careless, making the industry a risky one. However, serious incidents that result in a worker's death are often reported because of the potential costs and legal issues.
- h. Maintenance and inspection schedules are frequently ignored, and equipment repairs only happen after a malfunction. This strategy causes low productivity, time loss, unproductive employees, and production delays. Additionally, it could harm property.
- i. Due to the usage of poor electrical equipment and underground lines, electrocution is another significant risk.
- j. Workers, especially the young ones, regularly take risks and disregard safety regulations and personal protection equipment. Additionally, sometime employees and workers are under the effect of alcohol and other drugs.
- k. Before work begins, clients and consultants do prioritize safety, but as the project moves along, their focus on timelines take priority and they start to pay very little consideration to safety. Clients are not held to the same standard of moral responsibility as contractors when it comes to safety.

2.2.1 Safety Awareness and Compliance with H&S Requirements at Construction Sites

After doing an intensive amount of research an academic revealed that the primary focus of the majority of the contractors is revolving around increasing profit margin in a project. There are no rules and regulations for safety and the policies are not up to date, also, there are no safety engineers present on sites. So, the workers are exposed to the dangerous work environment and the only way they can learn about safety procedures are by doing mistakes and this way they will get experience.

Another shocking point was discovered from the interviews conducted by different contractors and project managers are that accidents are not reported to concerned authorities as the contractors are afraid of their qualitative assessment by the client. In underdeveloped

countries like Pakistan, rules and regulations for safety management are not enforced properly.

In the figure 2.2, it has been clearly shown that:

(a) 70% of the workers on construction sites are unaware of the safety rules and they think that labor does not need to take personal care and work in a comfort zone.

(b) So, a higher percentage of workers tend to resist the training sessions and get easily annoyed if asked to follow basic safety precautions.

(c) The majority of the workers and contractors believe that by following safety rules and taking precautions, the overall progress of the project will be affected. Very few of them think that taking safety measures has a positive effect on the quality of a project [41].

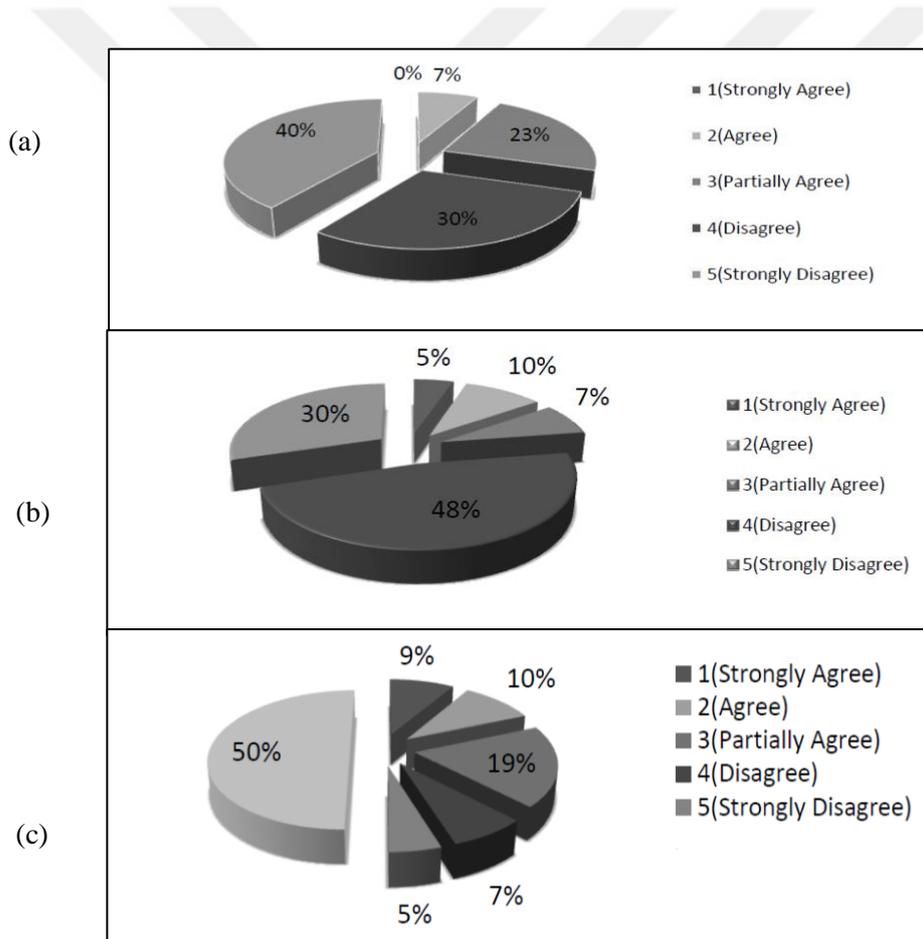


Figure 2.2: (a) Level of Awareness for Safety, (b) Labour Behavior Towards Safety Measurement, (c) Impact of Taking Safety Precautions.

2.3 IMPACT OF ABANDONED H&S MEASURES IN THE CI OF PAKISTAN

The environment of the construction industry requires safety awareness and knowledge to avoid the risk of any health injuries. The integration of safety measure helps to protect the environment as employees working at the construction sites deals with heavy loads, rough materials and have to operate large machinery. According to the study by [45], it is found that minimizing the risks helps to encourage a safe working environment at the workplace thus it also helps to motivate employees for improved performances. In addition, it is also reported through the study by [46] that around one-third of fatal injuries are reported due to a lack of proper health and safety measures in the construction workplace. The injuries are related to the fall incidence, accidents of employees crushed by vehicles or machinery or being struck by moving objects. The importance of ensuring H&S measures in the industry is to encourage a safe workforce environment for the employees.

The Ministry of Labor's Directorate of Workers Education (DWE), which was founded in 1982, is a training and educational organization tasked with educating and bringing attention to workers' rights and social issues by holding a variety of courses all year long for staff members, union representatives, and management representatives (GOP, 2005). There are several strict rules and regulations on child labor and the facility of a minimum wage.

Although there is a difference in wages of urban and rural areas. Government in central areas do revise periodically labor wages. But unfortunately, the implementation of safety regulations in Pakistan is not strictly followed. DWE works under the Ministry of Capital Administration & Development at the federal level. However, it has unsatisfactory performance.

A secondary entity called `The Center for Improvement of Working Conditions & Environment (CIWCE) ` has been established in the Province of Punjab by the Labor & Human Resource department in Lahore which provides professional and authentic services in the OH&S sector [47]. Few of the private institutions also provide OH&S training for the industry, such as; OCSP, OCTI, and the Vivid Institute of Occupational Safety and Health, although also on a commercial basis (VIOH).

PEC also conducts workshops on safety awareness and mandatory short CPDs, however, such training sessions are for engineers and supervisors only, whilst for construction workers no training is arranged [48].

Recognition of professional organizations can assist to guarantee the availability of appropriate health and safety procedures at work. The application of various strategies assists in encouraging the implementation of health and safety precautions in the workplace. According to the study by [44], training is essential for enabling the transfer of knowledge and techniques that might be used to deal with a hazardous situation.

The information offered should be supported by evidence and contribute to showing sufficient knowledge to sustain occupational health and safety. Learning from such sessions may help to a decrease in the number of fatalities brought on by workplace accidents in the construction industry. Moreover, it also helps to generate awareness among employees to implement relevant measures to protect themselves and others in the workplace.

PEC has included OH&S clauses in their manuals; however, they are largely not implemented because any concerned regulatory body is not there [37].

- a. Part I (General Contract Conditions) clause 19.1 of PEC's standard bid documents (PEC, 2007, p.90).
- b. Precautions for safety: Part II (Particular contractual terms) clause 19.3 of the standard PEC bidding document. (PEC, 2007, p.152)

As per the annual assessment of the Pakistan Bureau of Statistics, from the total labor force (59.79Million), 7.4% (4.424 million) labor is associated with the construction industry.

Table A shows a consistent increase in the rate of accidents and injuries i-e 14.55% in 2006 to 15.24% in 2012. Therefore, it lies in the 2nd place of the most injury lying industry just after agriculture sector [49].

Table 2.1: Occupational Accidents and Injuries; Division by Different Major Industries of Pakistan (Percentage-Wise) [49].

Name of Industry	The Financial year						Ranking
	2006-07	2007-08	2008-09	2009-10	2010-11	2012-13	
Agriculture	40.94	46.84	50.43	50.2	49.8	49.1	1
Mining/Quarrying	0.29	0.09	0.33	0.1	0.2	0.2	
Development	15.21	12.72	13.96	12.8	15.8	13.3	3
Electricity, gas and water	0.87	0.51	0.71	0.4	0.2	0.5	
Construction Industry	14.55	14.93	14.54	14.3	13	15.2	2
Restaurants, hotels, and retail businesses	9.26	7.96	7.54	10.6	10.3	9.2	4
Transport/Communication	7.98	8.02	8.14	8	7.1	7.3	
Social/Community Services	10.56	8.39	4.33	3.5	3.3	5.1	
Other remaining Industries	0.34	0.54	0.02	0.1	0.3	0.1	

The factors affecting the safety measures within the construction industry has been identified. The importance of ensuring H&S measures in the industry is to encourage a safe workforce environment for the employees. The environment of the construction industry requires safety awareness and knowledge to avoid the risk of any health injuries. The integration of safety measure helps to protect the environment as employees working at the construction sites deals with heavy loads, rough materials and have to operate large machinery.

The role of the construction managers is found responsible to ensure the protection of passersby and employees working in the workforce. Lack of these safety practices can result in the decrease of workforce employees which can affect the productivity and profitability of the business. Figure 2.3 presented below indicates the labour force and the accidents that happened in the sectors. It can be observed that most of the accidents occur in the agriculture

sector, and it carries 51% of the labour force, in terms of the accidents construction industry comes at the third number.

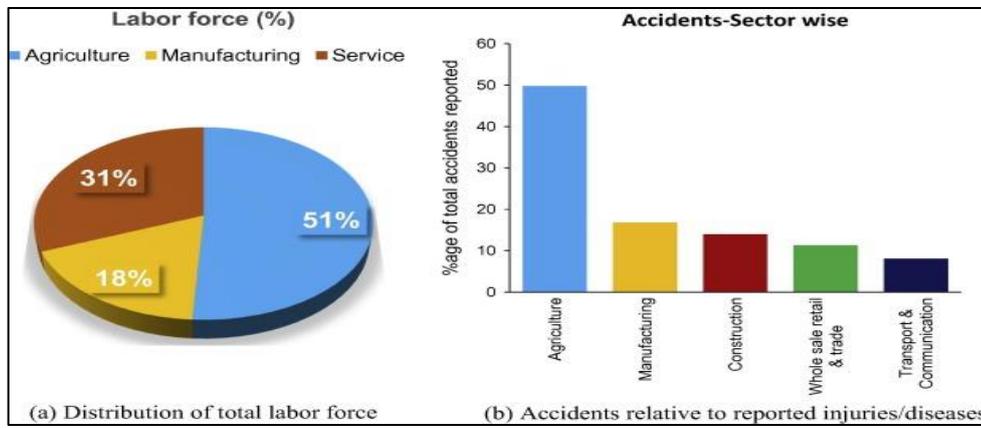


Figure 2.3: Construction Industry H&S (Source; Adeeba et al., 2016).

3. METHODOLOGY

3.1 INTRODUCTION TO METHODOLOGY

This chapter discusses and presents the research methodology used for this study. The research plan outlines how the researchers will conduct their investigation in order to meet and address their research objectives [51]. The main methods for collecting and generating research data are the questionnaire survey and interviews. This research work is conducted as an exclusive investigative study to evaluate the current standards of H&S being used in construction Industry of Pakistan and based on findings develop some remedial measures to improve the quality of construction sites. Flowchart for the research methodology used in this research is given in Figure 3.1.

After doing extensive research and analyzing the work of various global researchers, Extensive analysis of literature review is done, and different pre-developed questionnaires are studied. Total of 113 H&S practices which affected quality of safety standards in site are recognized, from detailed review of literature ([52]; [26]; [28]; [53]; [25]; [30]; and [14]). Based on the data collected from previous literature, those safety practices which are under the domain are categorized into 13 factors of safety. However, by further reviewing the questionnaire forms and making it suitable for the CI of Pakistan, number was reduced to 60.

The degree of construction safety performance is assessed using a five-point Likert scale, with 1 representing a very low performance and 5 representing a very high performance. The population of construction companies in the industry is used to choose the sample for this study. This survey involves all CI stakeholders, including clients, consultants, and contractors and subcontractors. The questionnaire is distributed among only between PEC registered companies. 79 of the 100 questionnaires that were sent are answered. Three incomplete questions are disregarded, leaving 76 questionnaires for the final analysis.

MS Excel and the Statistical Package for the Social Sciences are used to examine the data that has been gathered. To gauge the questionnaire's internal consistency, two tests are used. The first test is the Cronbach's Alpha method, while the second is the Split-Half method. The calculation of sampling error uses descriptive statistics. The Kruskal-Wallis test is used

to determine if all stakeholders' perceptions of the degree of safety performance differ or are comparable. Statistically significant associations in the data are defined as those with a 5% level of significance or more. The survey questionnaire is chosen to supplement and validate interviews on the other end. In order to do frequency analysis, reliability analysis, and SPI analysis on the data, MS Excel and SPSS-18 are used. The Kruskal Wallis test is used to examine any variations in how each stakeholder perceives the degree of safety performance.

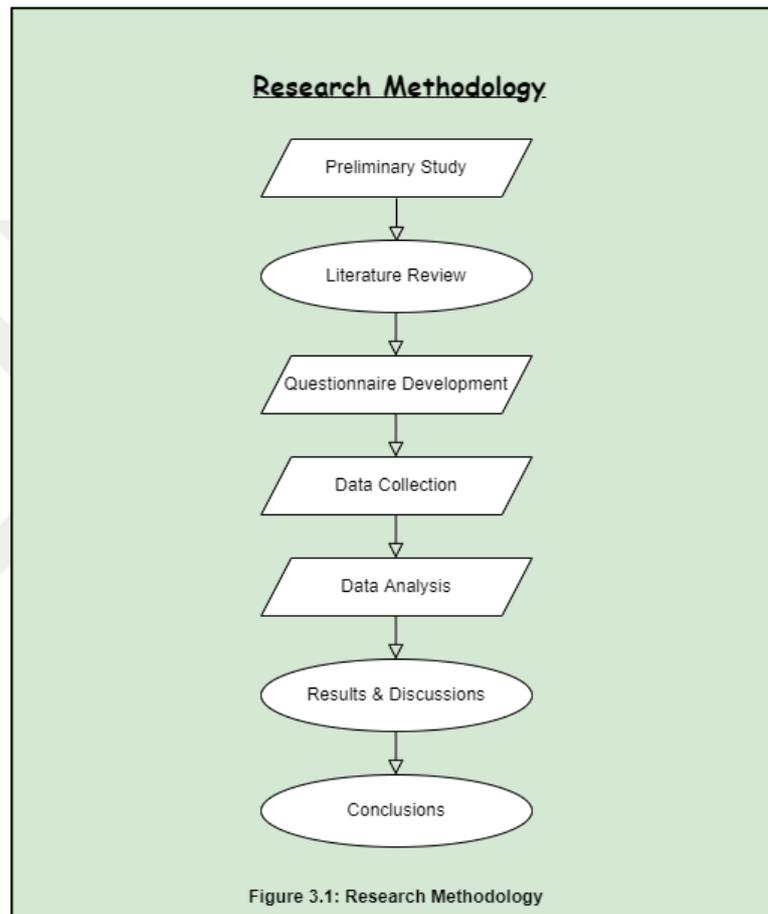


Figure 3.1: Research Methodology.

3.2 RESEARCH DESIGN

The first chapter sets out the research's primary objectives. Here, the relevant approaches to achieve these goals are presented. In the social sciences experiments, polls, research, journal articles, and history are utilized as research tools. The approach used for a given research also depends on the scope of the study, the nature of the research operation (what, how, why), the research's primary objectives, and the factors that may be controlled. It is essential to take the major research questions, the expected outcomes,

and the relationships between data collecting and analysis into account when choosing an acceptable research methodology. As a result, before beginning a research project, the research questions, the method of data analysis, and the type of data should be taken into account.

As a questionnaire survey is the most suitable research approach for this sort of investigation, it is used in this study [54]. Nifraz Najumudeen's questionnaire, which was utilized in 2011 to evaluate the safety measures in Sri Lankan CI, is acknowledged in the questionnaire design. To investigate the whole range of responses between "Yes" and "no," a five-point Likert scale is used in place of "Yes/No" answers [56]. The RII, which ranges from 0 to 1, is then determined using the responses to each statement or question. The shortcoming of the RII technique is that it may utilize skewed data, exaggerating the relative weight of a certain element.

$$\text{Safety Performance Index} = \frac{\sum w}{(A * N)} \quad (3.1)$$

$$\text{SPI} = [1 n_1 + 2 n_2 + 3 n_3 + 4 n_4 + 5 n_5] / [A * N] \quad (3.2)$$

Where;

w: weighting assigned to every factor of range 1-5 by respondents

n1: No. of received respondents for very low performance of sp.

n2: No. of received respondents for low performance of sp.

n3: No. of received respondents for moderate performance of sp.

n4: No. of received respondents for high performance of sp.

n5: No. of received respondents for very high performance of sp.

A: higher weight (In this case: 5)

N: number of samples (In this case: 76)

The survey questionnaire is reinforced and verified using various methods, such as interviews. In order to do frequency analysis, reliability analysis, and SPI analysis on the data, MS Excel and SPSS-18 are used. The Kruskal-Wallis test is used to examine any variations in how each

stakeholder perceives the degree of safety performance. In the relevant chapters, the choice of various statistical techniques will be introduced.

3.3 SURVEY OF THE SAMPLE

3.3.1 Selection of Sample

Using sampling, statistics has the purpose of providing a summary measurement of a few population variables. Various sampling techniques exist, depending on the population's characteristics. These samplings are random, non-random, and judgmental [57]. Without employing statistical sampling methods, sample selection in judgmental sampling is done based on the researcher's assessment. Since judgmental sampling is influenced by bias, the justification for its use should be made clear. When there is no obvious variation in the population structure, random sampling is performed.

The population of Pakistani construction companies is the source of the sample for this study. Given the size of the population, the sample will include a variety of construction experts, which include the clients, consultants, and contractors from diverse backgrounds and social groups. The survey for this study uses random sampling to include 33 projects from other cities in addition to practically all of the big and small projects that are currently under construction in Rawalpindi and Islamabad (21). Of course, polling every group in the whole CI would get the most representative findings, however doing so would take a lot of time and effort.

As a result, 100 randomly chosen respondents who were involved in 56 construction projects across 38 firms in 16 locations across Pakistan were given the questionnaire. The survey's primary focus was on residential and commercial structures. Because of confidentiality concerns, the location of the projects and respondents is not specified here. Even though the province-based distribution is shown here: Punjab (42), Sindh (6), AJK (6), and KPK (2). As a result, this sample includes all different types of projects and includes all of Pakistan's main cities.

3.3.2 Sample Size

Out of 100 responses, 76 were authentic, resulting in a 76% response rate overall. As a result, the research's response rate is satisfactory. Although it is unclear if this sample size really represents the population.

3.4 DESIGNING OF SURVEYS

3.4.1 Review of Previous Research

Much of the previous research conducted have emphasized the necessity of questionnaire design for a compelling survey ([58]; [59]). As a result, a well-designed questionnaire has questions that respondents can easily answer without exerting much effort, which keeps their attention while yet using little of their time. In addition, experts believe that mixed-mode surveys will boost response rates. In this study, a mixed-mode survey was used; some respondents had interviews, while others received questionnaires by mail. Combined survey methods are often advised to attain a high response rate [60]. Self-administering surveys, such internet, and emails surveys, have also emerged as a result of technological advancements.

There are several strategies for increasing benefits, lowering the social costs of survey participation, and gaining respondents' confidence [61]. Giving rewards to respondents can take the form of financial or material benefits, asking for their opinions, making the questionnaire engaging, advising them that there aren't many opportunities for them to participate, and providing a summary of the results.

3.4.2 Tailored Design Method

In this thesis, the survey is conducted using the tailored design method. The following points are considered throughout the survey:

It is appropriate to use encouraging words like "thank you for completing this questionnaire." By showing that they are a member of a carefully picked sample based on their expertise and professionalism in the CI, respondents are given value. The questionnaire contains five-point Likert scale questions, which take less time to answer than open-ended questions. Furthermore, it reduces respondents' mental effort when selecting an answer from a set of

options. Questionnaires are also sent to respondents via mail/email based on the availability of their addresses in order to obtain their responses. Additionally, respondents are given the assurance that their data will only be utilized for the present study and that their privacy will be respected.

Response rates are greatly impacted by follow-up actions. Without follow-up, response rates would be significantly smaller, regardless of how motivational the mail piece or compelling the questionnaires are [61].

3.4.3 Reliability and Validity of Survey

In order for a research instrument to serve its intended goal, it must be reliable and valid. When referring to a measure's consistency and likelihood of producing comparable findings when repeated, the term reliability is used. As a result, some experts will mention that the research tool utilized in earlier studies has already been shown to be legitimate and effective.

The same methodology is used in this study. The questionnaire was then modified after the results of a pilot survey and interviews with a few academic researchers and construction experts. In the end, it enhanced the questionnaire's validity and dependability.

3.5 STATISTICAL TERMINOLOGIES

The terminologies used in statistics that are utilized in this research are described below [13]:

3.5.1 Hypothesis Testing and Statistical Hypothesis

This phase of statistical inference is crucial because it allows one to choose whether to accept or reject a claim or assumption about the value of a population parameter based on the knowledge gained from sample data. The term statistical hypothesis refers to a statement or assumption of this nature that may or may not be accurate. When the sample data supports the hypothesis, it is accepted as being true; however, when the sample data does not, it is rejected.

3.5.2 Null Hypothesis and Alternative Hypothesis

Under the presumption that it is true, the null hypothesis, marked by H_0 , must be assessed for possible rejection. Any other hypothesis that is accepted after the null hypothesis is disproved is referred to as an "alternative hypothesis."

3.5.3 Significance Level and Test of Significance

When H_0 is taken to be true, the significance level is the probability used as a benchmark for rejecting H_0 as the null hypothesis. A rule or process known as the "Test of Significance" is used to evaluate sample results and determine whether to accept or reject the null hypothesis.

3.6 TECHNIQUES FOR DATA ANALYSIS

The data analysis tools utilized are MS Excel and SPSS-18. The research uses the standard of relevance, which is $\alpha = 0.05$. For analysis, the following statistical methods are employed.

3.6.1 Normality Test

The application of many statistical tests requires an assessment of the data normality. It is done to determine if the data is parametric or non-parametric in nature, and whether it is regularly distributed or not. The Shapiro-Wilk test is a more complete normality test intended for data sets with roughly 2,000 items or fewer.

3.6.2 Kruskal-Wallis Test and One Way ANOVA

For non-parametric data, one way ANOVA is utilized, however for parametric data, Kruskal-Wallis test is utilized. Since the gathered data failed the normality test, the Kruskal-Wallis test is utilized for further analysis.

4. RESULTS AND ANALYSIS

All stakeholders, including customers, consultants, and contractors, emphasize on improving quality, lowering costs, and reducing timeframes over safety in both the public and commercial sectors. The clients and contractors do not respect the rights of the workers. Workers themselves are also unaware of their rights to only work in a safe setting. Similar to this, there isn't a regulating body like OSHA that can enforce safety laws and guidelines on construction projects.

Meanwhile, significant construction businesses working on mega projects like high rise buildings and underground constructions that are registered with PEC in category C-A have begun investing in safety, despite of the fact that neither client encourages nor grants any budget for safety. Contractors are required by contract to maintain a safe workplace, but clients believe they are exempt from this obligation. Even on one of Islamabad's highest ongoing construction projects, an independent safety engineer is not hired.

The mechanical works are the safety manager's primary concern, while quality, health, safety, and the environment are his secondary tasks. Using MS Excel and SPSS-18, data obtained from questionnaire-based surveys and interviews is examined.

4.1 CHARACTERISTICS OF RESPONDENTS-FREQUENCIES AND PERCENTAGES

4.1.1 Distribution of Groups for Respondent Stakeholders

A 76% response rate is indicated by the 76 valid replies out of 100. Clients responded with 25%, consultants with 17.1%, and contractors with 57.9%.

Table 4.1: and Figure 4.1 illustrate grouping and frequencies (percentages) of respondents:

Table 4.1: Distribution of Groups for Respondent Stakeholders.

List of Respondents	Number of valid Questionnaires Answered			%	Cumulative %
Clients	19			25	25
Consultants	13			17.1	42.1
Contractors/Subcontractors	44			57.9	100
Total Value	76	100	—		

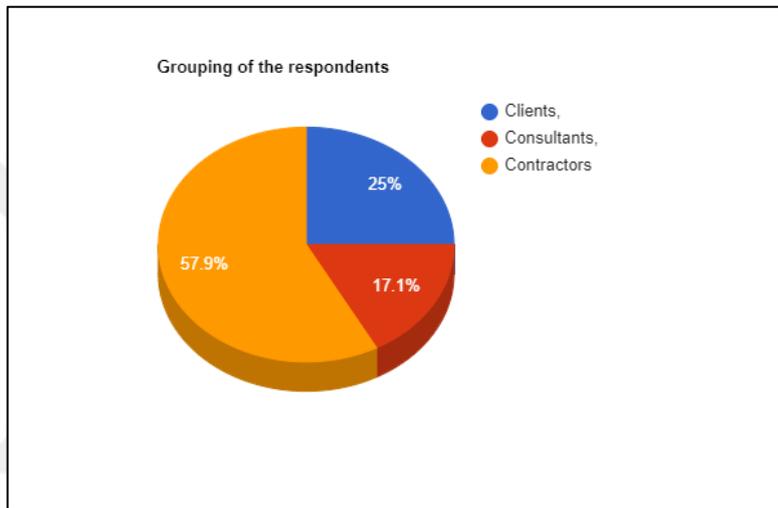


Figure 4.1: Distribution of Groups for Respondents Stakeholder's.

4.1.2 Respondents Stakeholder's Experience in the CI of Pakistan

In the CI, respondents have a variety of experiences, as illustrated in Table 4.2 and Figure 4.2. Only 15.8% (12) of the respondents had fewer than 5 years of building experience, compared to 55.3% (42) who have more than 10 years of experience, 28.9% (22) who have 6 to 10, and 28.9% (22) who have less than 6 years. Thus, it is safe to conclude that the information offered by these experts is accurate and trustworthy.

Table 4.2: Respondents Stakeholder’s Experience in the CI of Pakistan.

Respondents Experience in Years	Respondents Frequency	Respondents %	Cumulative %
0-5	12	15.8	15.8
6-10	22	28.9	44.7
11-15	29	38.2	82.9
16-20	7	9.2	92.1
20+	6	7.9	100.0
Total Value	76	100.0	-

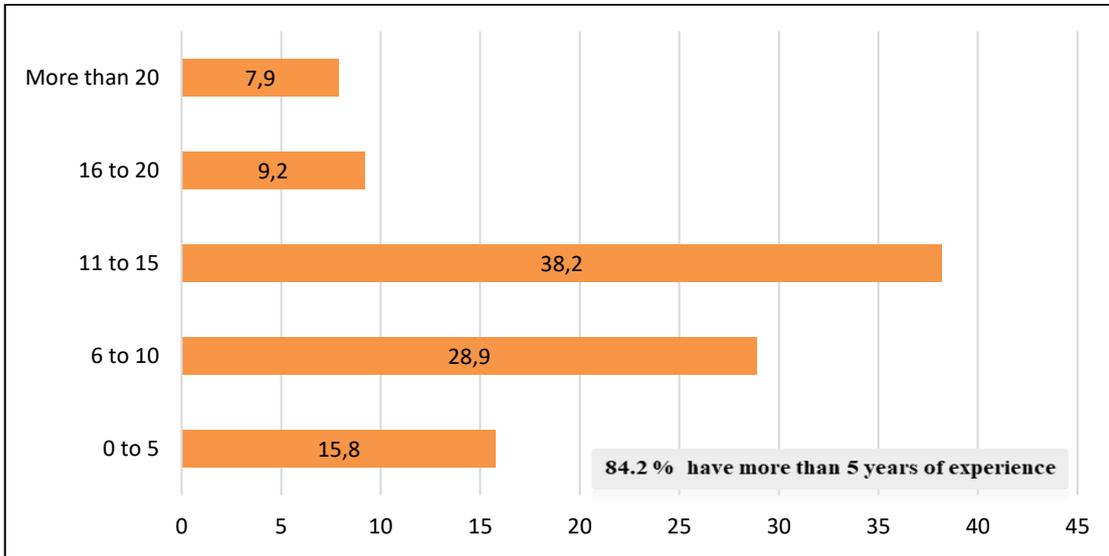


Figure 4.2: Percentages of Respondent Stakeholder’s Experience in the CI of Pakistan.

4.1.3 Positions of the Respondent Stakeholder’s In the CI of Pakistan

The respondents of this survey are from various levels of the CI. The percentages of various positions holders who answered to this survey are displayed in Table 4.3 and Figure 4.3. A total of 60 respondents, or around 39.5%, work in management at various levels, followed by 7.6% (42) field engineers, 12.5% (19) supervisors/foremen, 11.2% (17) labourers, and 4.6% (7) individuals who serve as safety officers and inspectors.

Table 4.3: Positions of the Respondent Stakeholder’s in Construction Industry.

Positions of the Stakeholder’s Respondents	Frequency of Respondent Stakeholders	%	Cumulative %
Site Managers	30	39.5	39.5
Site Engineers	21	27.6	67.1
Safety Inspectors	3	3.9	71
Labours	9	11.9	82.9
Supervisor/Foreman	10	13.2	96.1
Safety Officers	3	3.9	100.0

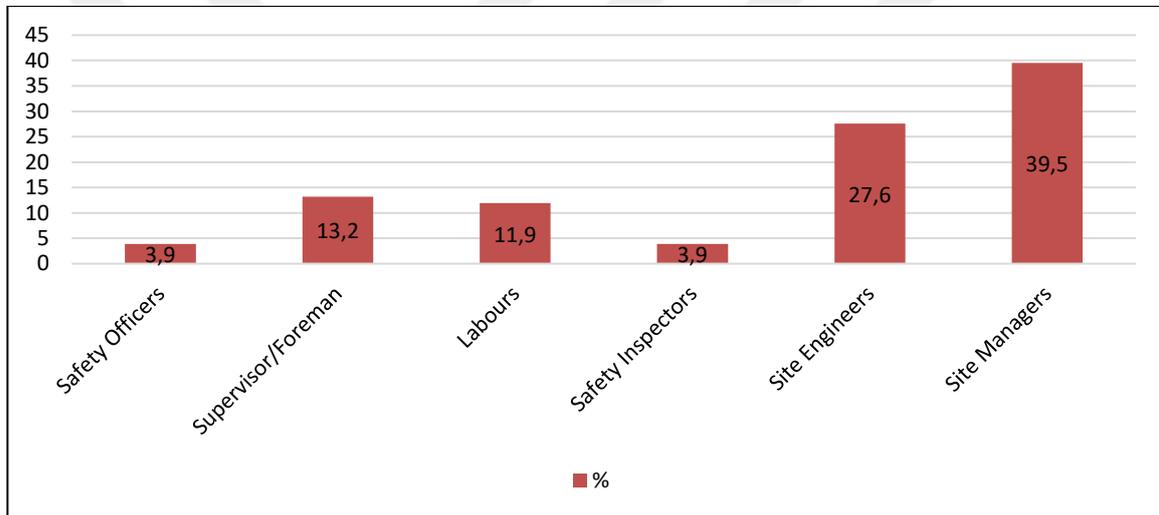


Figure 4.3: Percentage of the Respondent Stakeholder’s Based on Their Position.

4.1.4 Sectors of the Respondent Stakeholder’s

Stakeholders in the survey come from both the public and private sectors. According to Table 4.4, 52% of respondents work in the public sector, while 48% do so in the private sector.

Table 4.4: Frequency of Respondent Stakeholder’s Based on Sectors Type.

Sectors	Respondent Stakeholders Frequency	Percentage	Cumulative %
Public	36	47.4	47.4
Private	40	52.6	100.0

4.1.5 Categories of Construction Companies Included in The Survey

The respondents to this survey are all registered in various categories with the Pakistan Engineering Council (PEC). The identities of the responders are being kept private due to their confidentiality.

4.2 STATISTICAL ANALYSIS OF THE SAMPLING

4.2.1 Sample Reliability

4.2.1.1 Cronbach's Coefficient Alpha Method

The method of measuring internal consistency is frequently used with the help of Cronbach's Coefficient Alpha (reliability). When questions are asked using the Likert scale, it is most often used to evaluate the accuracy of the scale. If the Cronbach's Coefficient Alpha value is more than 0.7, the data are suitable for investigation; however, if it is greater than 0.9, the data are ideal for further analysis [63]. Using SPSS, it is determined for the obtained data to be 0.958, as shown in Table 4.5. The fact that it has a greater value means that the data can be trusted for further analysis and is consistent.

Table 4.5: Reliability Statistics.

Summary of Case Processed				Cronbach's Alpha	0.958
		N	%		
Total Cases	Valid	100	100	No. of Items	60
	Excluded ^a	24	24		
	Total	76	76		
a. List wise deletion based on all variables in the procedure.					

4.2.2 Normality Test

Since the sample size is smaller than 2000, the "Shapiro Wilk normality test" is used to determine whether the data gathered is normal. It is done to determine if the data is parametric or non-parametric in nature and whether it is regularly distributed. Relevant values were determined to be less than 0.05, at 0.000. Since the distribution of the data is not normal, non-parametric tests are needed for further research. The data for the Shapiro-Wilk test for normality are presented in Table 4.6.

Table 4.6: Tests of Normality- Shapiro Wilk Test.

Safety Practices	Shapiro-Wilk Test		Safety Practices	Shapiro-Wilk Test	
	Statistic	Sig.		Statistic	Sig.
SP01	0.987	.000	SP31	0.784	.000
SP02	0.841	.000	SP32	0.815	.000
SP03	0.796	.000	SP33	0.698	.000
SP04	0.899	.000	SP34	0.877	.000
SP05	0.771	.000	SP35	0.901	.000
SP06	0.777	.000	SP36	0.909	.000
SP07	0.811	.000	SP37	0.902	.000
SP08	0.854	.000	SP38	0.901	.000
SP09	0.869	.000	SP39	0.907	.000
SP10	0.873	.000	SP40	0.903	.000
SP11	0.862	.000	SP41	0.910	.000
SP12	0.915	.000	SP42	0.924	.000
SP13	0.900	.000	SP43	0.898	.000
SP14	0.848	.000	SP44	0.844	.000
SP15	0.866	.000	SP45	0.909	.000
SP16	0.920	.000	SP46	0.832	.000
SP17	0.936	.000	SP47	0.857	.000

Table 4.6: Tests of Normality- Shapiro Wilk Test “Table Continued”.

SP18	0.885	.000	SP48	0.845	.000
SP19	0.823	.000	SP49	0.897	.000
SP20	0.973	.000	SP50	0.901	.000
SP21	0.919	.000	SP51	0.894	.000
SP22	0.910	.000	SP52	0.865	.000
SP23	0.887	.000	SP53	0.884	.000
SP24	0.926	.000	SP54	0.804	.000
SP25	0.906	.000	SP55	0.888	.000
SP26	0.878	.000	SP56	0.879	.000
SP27	0.854	.000	SP57	0.869	.000
SP28	0.885	.000	SP58	0.882	.000
SP29	0.877	.000	SP59	0.821	.000
SP30	0.909	.000	SP60	0.801	.000
<i>Sig: significance value</i>					

4.2.3 Kruskal Wallis Test for All Safety Factors

The Kruskal-Wallis test assesses stakeholder perceptions of safety aspects' performance using nonparametric data, comparing clients, consultants, contractors, and subcontractors. Table 4.7 illustrates that all stakeholders, with the exception of “Dedication of Management to safety,” “Safety Rules and Regulations,” and “Trainings on Safety,” have comparable perceptions regarding the performance level (rating) of all safety elements. These three safety variables have significance values that are less than 0.05, indicating that stakeholders have ranked them differently. In order to further examine these three safety variables, the Kruskal Wallis test is used to determine the significant value.

Table 4.7: Kruskal Wallis Test a,b.

S. No	Safety Factors	Sig.
1	Dedication of Management to safety.	<u>0.037</u>
2	Participation of Worker's	0.059
3	Safety in the Contract Documentation	0.220
4	Safety Rules and Regulations	<u>0.017</u>
5	Reporting & Accident Investigation	0.131
6	Trainings on Safety	<u>0.027</u>
7	Meetings for Safety	0.096
8	Worker incentives and disincentives	0.088
9	Use of Personnel Protective Equipment	0.064
10	Storage, Sensation & Housekeeping	0.264
11	Scaffolding/Ladders Quality	0.539
12	Precautionary Measures during Excavation & Shoring	0.799
13	Using Hoists & Cranes	0.677
a. Kruskal Wallis Test		b. Grouping Variable

4.3 IMPLEMENTATION OF SAFETY STANDARDS

4.3.1 Budget Allocation for Safety Compliance

Respondents are questioned that how much funds they have set aside for safety on their construction sites. A budget has not been set up for safety, according to 61.8% (47) of the 76 respondents, which is highly frightening for Pakistani CI. According to 33% (25) of the respondents, the safety budget for their projects is less than 1%, and even that is solely for the workers' personal protective equipment (PPE). 3.9% of respondents said they have budgeted between one and two percent for safety, while 1.3% said their sites has set aside a budget for safety of between two and four percent. The fact that most companies lack safety policies, and none have budgets for safety exceeding 4% must be stressed. The budgetary allocation for safety in the CI of Pakistan is shown in Figure 4.4.

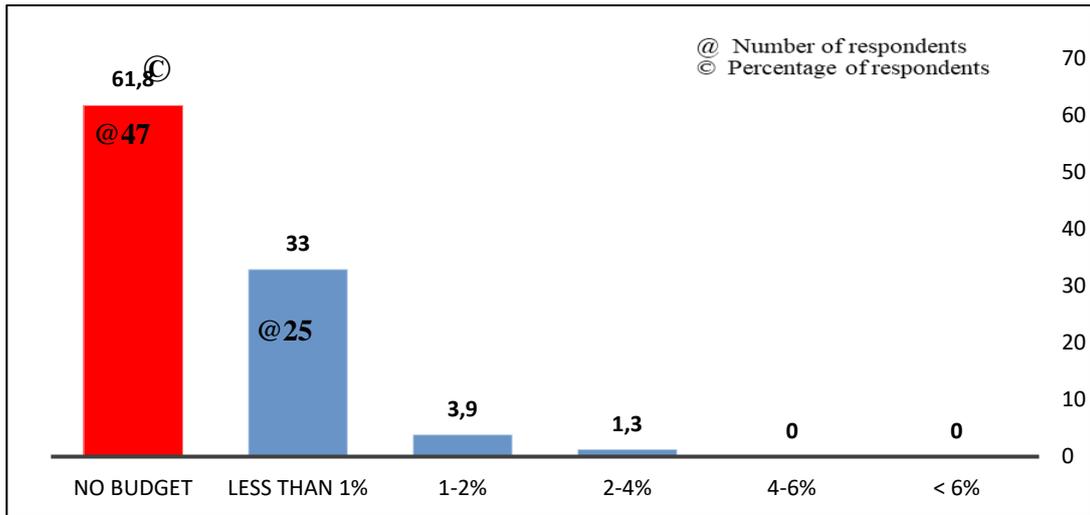


Figure 4.4: Budget Allocation for Safety Compliance in CI of Pakistan.

4.3.2 Frequency of Tool Box Meetings on Construction Sites

The frequency of tool box meetings on building sites is seen in Figure 4.5. This is one of the most overlooked parts of Pakistani CI. It should ideally take place once each week. 46% (35) of respondents indicated that tool box meetings are never held on their projects; 32.9% (25) said that they happen once every 15 days; 14.5% (11) said that they happen weekly; 3.9% (3) said that they happen twice weekly; and 2.7% (2) said that they happen every day.

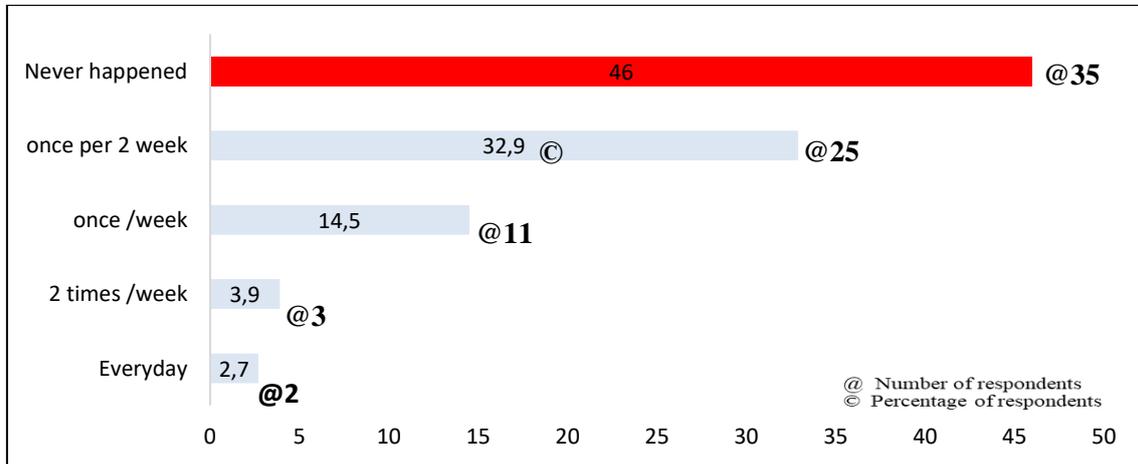


Figure 4.5: Tool Box Meetings Frequency.

4.4 ASSIGNING RANKS TO SAFETY FACTORS BY MEAN AND SPI

The questionnaire has 60 statements and questions to gauge how well current safety procedures are doing. 13 safety criteria are used to better organize these safety practices. MS

Excel and SPSS-18 are used to analyses the data gathered from 76 respondents. Table 4.8 contains the derived means, percentages, safety performance indices (SPIs), and ranking of the 13 safety variables. In CI of Pakistan, the mean value of safety procedures is estimated to be 3.06, although it should ideally be closer to 5. The Pakistani CI's Safety Performance Index (SPI), which is determined at 0.6118. Using Hoists & Cranes, one of 13 safety factors, has the greatest SPI value (0.782), while "Trainings on Safety" has the lowest SPI rating (0.521). According to this, the most overlooked part of Pakistani CI is "Trainings on Safety," which is followed by "Safety in the Contract Documentations," "Meetings for Safety," and "Participation of Workers." Precautionary measures during excavation and shoring, on the other hand, have a higher performance level followed by the factor "Using Hoists & Cranes."

Table 4.8: Mean, Percentage, SPIs and Overall Ranking.

S. No	Safety Factors	Mean	Percentage	SPIs	Overall Ranking
1	Dedication of Management to safety.	3.137	62.533	0.625	7
2	Participation of Worker's	2.668	54.132	0.541	10
3	Safety in the Contract Documentation	2.603	52.150	0.522	12
4	Safety Rules and Regulations	2.898	58.045	0.580	8
5	Reporting & Accident Investigation	3.159	63.860	0.639	5
6	Trainings on Safety	2.615	52.103	0.521	13
7	Meetings for Safety	2.623	52.531	0.525	11
8	Worker incentives and disincentives	2.804	55.898	0.559	9
9	Use of Personnel Protective Equipment	3.170	62.829	0.628	6
10	Storage, Sensation & Housekeeping	3.411	68.328	0.683	3
11	Scaffolding/Ladders Quality	3.247	64.934	0.649	4
12	Precautionary Measures during Excavation & Shoring	3.503	69.751	0.698	2

Table 4.8: Mean, Percentage, SPIs and Overall Ranking “Table Continued”.

13	Using Hoists & Cranes	3.911	78.208	0.782	1
Average of CI of Pakistan		3.06	61.177	0.6118	-

Figure 4.6 displays the order in which the 13 safety considerations are ranked using SPIs. The SPI of CI of Pakistan's average value is shown in light brown. The high performance of "Using Hoists & Cranes" and "Precautionary Measures during Excavation and Shoring" is highlighted by the green colour. The four safety aspects that are most frequently overlooked are underlined in red: "Trainings on Safety," "Safety in the Contract Documentations," "Meetings for Safety," and "Participation of Workers."

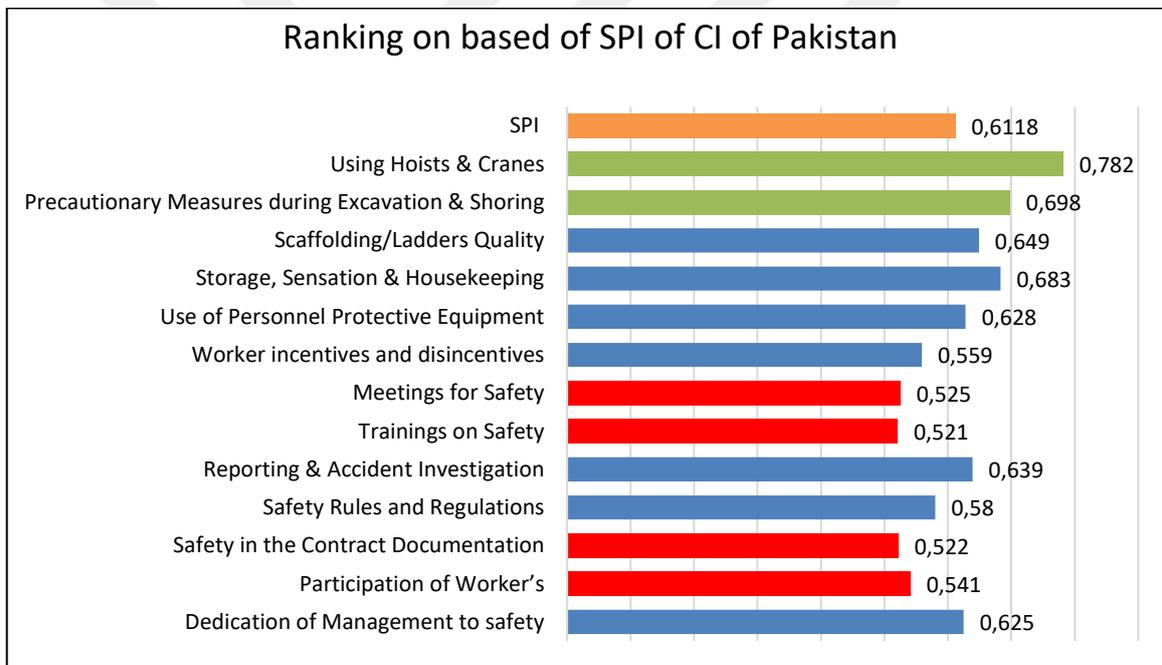


Figure 4.6: Ranking on Based of SPI of CI of Pakistan.

4.5 ASSIGNING RANKS TO SP BY MEAN AND SPI

Using SPSS-18 and MS Excel, the information obtained from 76 respondents for sixty (60) safety procedures was evaluated. All safety procedures have been ranked according to their means, percentages, and safety performance indices (SPIs). Table 4.9 lists the order of all safety procedures both overall and within each element. The average value of all safety procedures is calculated to be 3.06, and the safety performance level of the CI of Pakistan

is calculated to be 61.177%, even though it should ideally be closer to 100. All stakeholders should pay attention to this and cooperate to raise safety standards in Pakistan's CI.

Table 4.9: List of All SPS Along with Its Order.

Safety Factors		Mean	Percentage (%)	SPIs	Ranking of SP based on SPI	
					In factor	Total (1 to 60)
1. Dedication of Management to safety						
1	Safety is the top priority for upper management.	2.79	56.0515	0.560515	8	41
2	Safety is prioritized over time and there is work pressure on employees	2.59	52.514	0.52514	9	51
3	Higher management/safety officials conducts regular safety inspections	3.01	58.2904	0.582904	7	37
4	Workers are encouraged to work within safety standards	3.5	66.498	0.66498	3	20
5	Health and safety of employees is taken into consideration by Company	3.34	65	0.65	5	23
6	Giving reports on hazards are encouraged by the Field Engineer, Supervisor, and Safety Officer.	2.98	67.901	0.67901	1	13
7	Any issue regarding safety is quickly taken into consideration by management.	3.28	64.755	0.64755	6	24
8	Good communication between management and employees is established.	3.45	67.5	0.675	2	15
9	Management always makes sufficient manpower and equipment available to do the job safely.	3.29	65.3	0.653	4	21
2. Participation of Worker's						
10	Workers follow safety rules strictly.	2.54464	53.101	0.53101	2	49
11	Workers face strong reaction on violation of safety standards by other fellow workers.	2.5723	51.645	0.51645	3	54
12	Despite the fact that workers are not being supervised. All of them strictly follow rules	2.6	52.225	0.5223	4	58
13	Safety rules are not taken serious by the workers.	2.95654	58.998	0.58.998	1	33
3. Safety in the Contract Documentation						
14	The contract strictly requires the contractor to add his "safety policy" for the project.	2.66079	53.356	0.53356	1	46
15	Before beginning each task, "safety plan." is required by contractor.	2.54605	50.944	0.50944	2	55

Table 4.9: List of All SPS Along with Its Order “Table Continued”.

4. Safety Rules and Regulations						
16	In accordance with OSHA, the company has developed its safety policy.	2.74333	54.898	0.54898	5	44
17	A site emergency plan has been developed, and each task has undergone a job hazard analysis.	2.78447	55.777	0.55777	3	42
18	Regular safety audits are carried out.	2.59888	51.984	0.51984	6	<u>53</u>
19	On-site first-aid services are provided.	3.6312	72.661	0.72661	1	6
20	Workers are regularly medically examined.	2.86194	57.557	0.57557	2	39
21	Workers' compensation insurance is available.	2.76974	55.395	0.55395	4	43
5. Reporting & Accident Investigation						
22	There is a written mechanism for reporting and investigating accidents.	3.24354	64.8	0.648	2	25
23	Accidents are always reported and documented.	3.46611	69.742	0.69742	1	9
24	Accidents are always investigated to determine what caused them.	3.22488	64.744	0.64744	3	26
25	Near misses are also investigated in order to reduce future risks.	2.70263	56.153	0.56153	4	40
6. Trainings on Safety						
26	New employees must complete mandatory training.	2.63155	52.232	0.52232	2	50
27	All employees receive refresher safety training on a regular basis.	2.3092	46.101	0.46101	5	<u>59</u>
28	Subcontractor employees are also given health and safety training.	2.30263	46.053	0.46053	6	<u>60</u>
29	Workers receive adequate job-specific safety training before beginning work.	2.51316	50.011	0.50011	4	<u>56</u>
30	An organizational chart presenting names, positions, and responsibilities for safety is clearly presented.	2.61842	52.118	0.52118	3	<u>52</u>
31	Posters of safety in English and Urdu are used at key locations to raise worker awareness.	3.31579	66.1	0.661	1	17
7. Meetings for Safety						
32	Weekly tool box meetings are held.	2.67763	53.553	0.53553	2	47
33	All progress and pre-construction meetings include a discussion of safety.	2.67707	53.777	0.53777	1	45
34	In safety meetings, Subcontractors take participation.	2.51316	50.263	0.50263	3	<u>57</u>
8. Worker incentives and disincentives						
35	Workers are being rewarded for the completion of tasks according to safety standards.	2.68105	53.2421	0.532421	2	48
36	Those who violates safety rules are fined and training is given to them.	2.92763	58.553	0.58553	1	36

Table 4.9: List of All SPS Along with Its Order “Table Continued”.

9. Use of Personnel Protective Equipment						
37	An efficient system for issuing, inspecting, and replacing personal protective equipment (PPE) is given by the company.	3.21053	64.211	0.64211	2	27
38	PPE available on site is of high quality.	3.55421	67.554	0.67554	1	16
39	It is mandatory to wear safety helmets when working on the site.	3.20395	64.079	0.64079	4	29
40	Hearing protection and safety glasses are used where necessary.	2.94079	58.816	0.58816	5	35
41	Workers at heights always wear a safety belt and a secure lanyard.	3.21151	64.287	0.64287	3	28
42	Where safety belts cannot be used, safety nets are used to prevent falls.	2.90132	58.026	0.58026	6	38
10. Storage, Sensation & Housekeeping						
43	Before beginning work, the site layout is planned, and materials are properly stored.	3.55921	71.184	0.71184	4	7
44	All openings and excavated areas are marked with flags or barricades.	3.43421	68.684	0.68684	5	11
45	Sharp edges are covered/protected.	2.97053	59.311	0.59311	10	34
46	Where necessary, arrangements for proper lighting are made.	3.77542	74.554	0.74554	1	3
47	A sufficient amount of water is provided for drinking and washing.	3.67763	73.553	0.73553	2	4
48	Wet spots and walkways or staircases are cleaned up on a regular basis.	3.15789	63.158	0.63158	9	31
49	Scrap is disposed of on a regular basis.	3.1145	63.888	0.63888	8	30
50	There will be no careless throwing or dropping of materials or equipment.	3.40789	68.158	0.68158	6	12
51	On-site wind protection is provided to avoid any incident.	3.37542	67.998	0.67998	7	14
52	Ventilation is provided in tight spaces.	3.64484	72.985	0.72985	3	5
11. Scaffolding/Ladders Quality						
53	Scaffolds are used that are properly designed and fastened, and daily inspections are made.	3.28389	65.568	0.65568	2	19
54	On working scaffold platforms proper guard rails are installed.	3.15132	63.026	0.63026	4	32
55	On the construction site, good quality ladders with no broken rungs are used.	3.26316	65.263	0.65263	3	22
56	Before using Mobile Work Platforms (MWP), safety belts are always securely fastened	3.29847	65.879	0.65879	1	18
12. Precautionary Measures (Shoring and Excavation)						
57	Sloping or shoring is always used to prevent trench cave-ins.	3.44737	68.947	0.68947	2	10
58	Workers who are working in deep ditches are constantly monitored.	3.55842	70.555	0.70555	1	8

Table 4.9: List of All SPS Along with Its Order “Table Continued”.

13. Using Hoists & Cranes						
59	Before using, Hoist and cranes are carefully inspected.	3.92	79.379	0.79379	1	1
60	Objects are carefully secured and fastened before lifting them up.	3.90132	78.026	0.78026	2	2
Average CI based on SP's		3.0577	61.177	0.6120	-	-

4.5.1 Frequency Distribution of SPs

The frequency distribution of the safety performance level, which was derived using the replies of 76 respondents, is shown in Figure 4.7. The proportion of respondents for each level of safety performance is shown on the y-axis. The x-axis shows the safety performance scores submitted by the respondents, which range from 1 to 5. A frequency distribution study reveals that just 7.56% of respondents gave a score of 1 (very low), while 23.13% gave a score of 2, while 31.37% gave a score of 3, 30.789% gave a score of 4, and 7.17% gave a score of 5 (extremely high).

This indicates that just 37.359 percent of respondents think the safety performance of Pakistan's CI is good, while 62.333 percent think it is unsatisfactory. Therefore, it is necessary to enhance Pakistan's CI's safety performance.

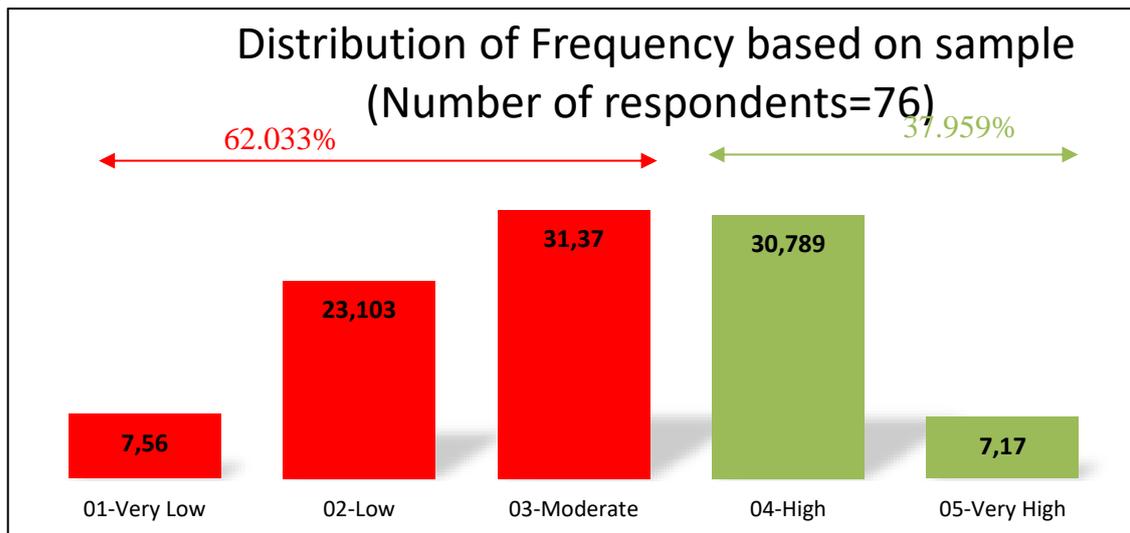


Figure 4.7: Frequency Distribution of SPs.

4.5.2 Better SPs in CI of Pakistan

Although there is a room for betterment in all aspects of safety, below are some better safety practises in the CI of Pakistan, such as hoists and cranes are carefully secured and inspected before usage. Before lifting an object, it is fastened. Where necessary, adequate lighting arrangements are made. A sufficient amount of water is provided for drinking and washing. Proper ventilation is provided in tight spaces. On-site necessary first-aid services are provided. Before beginning work, the site layout is planned, and materials are properly stored. People working in deep ditches are constantly monitored. Accidents are always reported and documented. Sloping and shoring are always used to prevent trench cave-ins.

4.5.3 Some Neglected SPs in CI of Pakistan

There are some neglected safety practises in Pakistan's CI, which needs special consideration to improve safety performance are: Subcontractor employees do not receive health and safety training. There are no proper training sessions for workers. When workers are not supervised, they take unnecessary risks. Subcontractors don't take importance of safety meetings seriously and are not encouraged to attend. No job-related safety training is provided to employees prior to the beginning of a job. The contractor is not required to submit a "safety plan" prior to the start of each task. Workers don't condemn other co-worker for violations of safety rules. Safety audits are not performed on a regular basis. On-site, there is no organisational chart displaying the names, positions, and responsibilities of safety officials. Work pressure exists to complete the task on time, resulting in a compromise on safety. New employees receive no training. Workers who complete the task in accordance with safety standards are not rewarded. Toolbox meetings are not organized on a weekly basis. The contract does not require the contractor to submit his "safety policy" for the project. Safety factor is not discussed during ongoing and pre-construction meetings. The company has not created a safety policy. Workers are not covered by insurance. 'Job hazard analysis' and 'Site emergency plan' are not carried out. Higher management does not prioritise safety.

4.6 ANALYSIS OF SAFETY FACTORS

4.6.1 Dedication of Management to Safety

Through nine questions, the top management's dedication to safety compliance is examined. Results demonstrate that field engineers and safety officers always promote the reporting of dangers on site, and that there is strong communication between the management and personnel there. The fact that "employees are continually under pressure to finish the allocated assignment in time and their safety is overlooked most of the time" is one of the elements that requires significant improvement.

4.6.2 Participation of Worker's

Four questions are used to examine the workers' commitment to following safety regulations. This component is fourth from the bottom overall, thus it requires extra care. The data indicate that staff do not voluntarily adhere to safety regulations and procedures and do not feel comfortable using personal protective equipment. Workers must be made aware of the value of safety through training and media efforts.

4.6.3 Safety in the Contract Documentation

Despite the fact that most contracts include safety clauses, the client does not set aside any money for safety. Although it is anticipated that the contractor would provide a safe working environment, there is no budgeting for safety in the project costs. Only projects with a greater level of risk, like tunneling, are given a safety budget. Out of 13 safety criteria, this one is ranked second to lowest overall. The situation can only be made better if PEC takes the initiative to ensure that the safety measures currently included in PEC's contract contracts are followed.

4.6.4 Safety Rules and Regulations

Six questions are used to examine safety processes and guidelines. Most of the time, work is done without doing a job hazard analysis and without offering any insurance to the employees. However, the majority of the locations include first aid facilities.

4.6.5 Reporting & Accident Investigation

The results suggest that while many project sites have a somewhat developed system for reporting and recording accidents, investigations to identify their underlying causes are rarely conducted. Close calls are seldom investigated. A suitable framework for accident reporting and inquiry must be developed, and this can only be done if a regulatory body keeps track on the safety performance of all active projects nationwide. It is crucial to note that 98% of respondents did not provide the record of injuries and fatalities due to the confidentiality of the information.

4.6.6 Trainings on Safety

As the least important of the 13 safety considerations, it is also the most overlooked. Six inquiries are used to examine this component. Safety signs and banners are used to inform workers, but new workers do not receive thorough training or briefings. There is no refresher training at all. Workers are not provided with job-specific training to guarantee their safety while undertaking dangerous tasks. Additionally, the majority of the locations do not exhibit organizational charts outlining safety responsibilities. The fact that subcontractor personnel receive no safety training, and no protective gear is another grey area.

4.6.7 Meetings for Safety

Among the 13 safety considerations, this one is the third-least important and one of the most overlooked. The findings indicate that the majority of project sites do not hold tool box meetings. Subcontractors are also discouraged from attending safety sessions. Safety-related topics are not included at progress meetings, which are mainly concerned with productivity difficulties. This situation can only be changed if all involved parties are made aware that ensuring worker safety would undoubtedly enhance production. A safe workplace will eventually cut down on the expense and length of time spent treating injured employees.

4.6.8 Worker Incentives and Disincentives

If contractors offer incentives to their staff, safety can be increased. Therefore, if a contractor's primary priority is how to cut costs and save money, the client must take the

initiative to increase safety. The clients should compel the incorporation of safety measures at the building sites.

4.6.9 Use of Personnel Protective Equipment

Six questions are used to examine this safety factor. PPE is offered to workers by almost all registered companies with PEC in the C-A category, however the amount and quality of PPE are still in doubt. Most of the time, safety helmet use is the only PPE stressed, with minimal attention paid to other PPEs. Few of the employees on a flyover project in Rawalpindi received PPE, but it was of poor quality. Two employees were seen working on a scaffold while being watched over by a foreman on the same job. One of the workers was wearing a safety belt, but the other had none. When a worker on a high-rise construction project found it uncomfortable to reach a certain point from his platform, he unhooked his safety belt from the lanyard, completed the task, and then refastened it.

4.6.10 Storage, Sensation & Housekeeping

This element received a higher rating from respondents than other safety factors. The findings show that while housekeeping is typically adequate, sanitation standards are relatively low. However, utilities, such as water for bathing and washing, require significant upgrades. Similar to this, all openings must be closed and labeled properly.

4.6.11 Scaffolding/Ladders Quality

While major projects often employ excellent quality steel scaffolds, residential projects typically use low-grade wooden scaffolds, with guardrails sometimes missing from the platforms of the latter. All CI stakeholders must be informed about the need of using scaffold guardrails to avoid falls.

4.6.12 Precautionary Measures (Shoring & Excavation)

This factor, which the respondents identified as the second most important, is examined using just two straightforward questions. The stakeholders must be made aware of the safety measures needed for excavation and shoring, such as the operator's protection when operating heavy machinery.

4.6.13 Using Hoists & Cranes

The responders gave the operation of hoists and cranes top rankings. The majority of locations have good-quality hoists and cranes, and their functioning is constantly observed. Before lifting, it is also made sure that the things are securely connected.

4.7 CHALLENGES ENCOUNTERED DURING SAFETY STANDARDS SURVEY

In this exclusive investigative study of health and safety (H&S) standards in Pakistan's construction industry, main methods for collecting and generating research data were through detailed questionnaire survey and interviews. To gauge the questionnaire's internal consistency, two tests are used. The first test is the Cronbach's Alpha method, while the second is the Split-Half method. The Kruskal-Wallis test was used to determine if all stakeholders' perceptions of the degree of safety performance differ or are comparable

The primary challenge encountered was the language barrier in a linguistically diverse country, requiring interpreters and translators. Establishing trust with respondents emerged as another crucial challenge. Given the sensitive nature of the topic and concerns about potential repercussions for speaking candidly, many participants were initially hesitant to share their genuine opinions and experiences. Building trust and assuring anonymity were essential steps in gaining the confidence of the respondents. Some respondents, particularly those in influential positions, were wary of disclosing sensitive information about H&S practices and incidents within their organizations. Consequently, specific details and documents related to injuries and fatalities were often withheld, limiting the depth of the data we were able to collect. Non-serious behavior of some respondents and the lack of awareness among workers and management regarding safety rights and responsibilities added complexity.

The absence of a regulatory body similar to the Occupational Safety and Health Administration (OSHA) in Pakistan, presented a considerable challenge. Without a dedicated authority to enforce safety laws and guidelines on construction projects, the industry lacks a clear framework for ensuring H&S standards are upheld. Despite these challenges, addressing them is crucial to improve safety standards, enhance the industry's quality, and protect stakeholders' well-being in Pakistan's construction sector.

4.8 SUMMARY OF THE CHAPTER

This chapter has covered statistical analysis. In order to evaluate the degree of safety performance of CI of Pakistan, sixty safety procedures were examined using SPSS-18. Data was gathered from construction firms that are PEC registered and engaged in 54 different projects throughout different provinces in Pakistan. For additional examination, the data's high Cronbach's Coefficient Alpha value (0.958) demonstrated its high reliability. The non-parametric test is used to assess the differences in perceptions of all stakeholders on the degree of safety performance in the CI of Pakistan after the Shapiro Wilk normality test revealed that the data was not normally distributed.

The safety factor of "Using Hoists & Cranes," followed by "Precautionary Measures (Shoring & Excavation)," shows a higher performance level. The factor "Trainings on Safety" has the lowest degree of safety performance, followed by "safety in the contract documentation," "meetings for safety," and "worker participation," in that order.

Additionally, the twenty worst and ten best safety procedures are emphasised. In decreasing order, the top five safety precautions that need special attention are:

- a. Subcontractor employees do not receive health and safety training.
- b. There are no refresher safety training sessions for workers.
- c. When workers are not supervised, they have a tendency to take unnecessary risks.
- d. Subcontractors do not participate in safety meetings.
- e. The contract does not require the contractor to submit his "safety policy" for the project.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 BRIEF REVIEW OF RESEARCH OBJECTIVES

In order to evaluate and to assess the following objectives defined in this work, certain conclusions are made in 5.2.

- a. Evaluating the effective degree of safety standards in Pakistan's CI (Through surveys based on questionnaires and interviews).
- b. Assessing the worst safety practices (through RII method).
- c. Assessing the safety record of various ongoing construction projects.
- d. Making recommendations for how to raise the level of safety performance in Pakistan's CI.

5.2 CONCLUSIONS

Throughout the research work, all of the major findings are listed below:

- a. PEC has included safety clauses in the contract documents and the Pakistani government has created labour laws, however, these laws are not enforced because there is no equivalent of OSHA to act as a regulatory body.
- b. Workers are not aware of their rights to exclusively work in "safe work environments," and their rights are not prioritized.
- c. With the help of surveys conducted it is concluded that the safety performance of Pakistan's CI is substandard.
- d. Approximately 60% of respondents believe that CI's safety performance is inadequate due to the lack of basic SPs at construction sites.
- e. All of the stakeholders are only concerned with enhancing quality of work and minimizing cost and timeframe of the project.
- f. The client does not devote any funds for safety.

- g. The majority of construction companies (approximately 60%, with only a few exceptions) lack a "safety policy."
- h. Safety managers are not even available on most of major construction sites.
- i. Those construction companies which fall under the C-A category (issued by PEC) take all necessary steps to work on standards of safety.
- j. In order to minimize cost of the project, implementing safety policies on site is sometimes disregarded, despite the fact that it can have a considerable impact on overall costs. All stakeholders are under the impression that the cost of the project will be higher if they start investing in implementation of safety policies.
- k. Due to confidentiality concerns most of the respondents refused to submit any documents related to injury and fatalities of particular projects.
- l. Since there is no proper check and balance by the concerned departments, so no one investigates reported accidents.
- m. Subcontractors do not understand the importance of safety and that is why meetings on safety awareness are rarely organized.
- n. Workers are usually fined if they are involved in violation of safety rules, but this happens only in mega projects. Also, there are no rewards or bonuses awarded to those workers who have performed their tasks while maintaining all the standards of safety.
- o. Housekeeping standards are generally adequate, but sanitary facilities, especially the availability of lavatories, are terrible. Similarly, openings are rarely covered against falls, therefore this issue requires consideration.
- p. Since top quality steel scaffolds are only used on large projects and in smaller projects substandard wooden scaffolds are used. Also due to absence of guard rails workers often fell down from the height.
- q. One of the safety factors, "Using Hoist and cranes" has higher value while evaluating the survey based on questionnaire.

- r. One of the safety factors “Trainings on safety” has lowest value while evaluating the survey based on questionnaire.
- s. Those SPs which are adapted in nearly all mega and small projects are listed as below:
 - i. Hoists and cranes are inspected before to use.
 - ii. Objects are secured before being lifted using the crane.
 - iii. Where necessary, adequate lighting arrangements are made.
 - iv. A sufficient amount of water for drinking and washing is provided.
- a. In confined locations, ventilation is achieved.
- b. A first-aid facility is set up on-site.
 - i. Those SPs which are not adapted and needs special attention from all stakeholders are listed as below:
 - a. Subcontractor staff are not given health and safety training.
 - b. There are no refresher safety training courses for workers.
 - i. When workers are not supervised, they have an inclination to take unwarranted risks.
 - ii. Subcontractors do not give proper importance to the safety meetings.
 - iii. There are no specific safety training sessions that are organized for the workers to spread awareness of safety among them.
 - iv. Due to the lack of seriousness, contractors do not provide any safety plans in the beginning of the project.

5.3 GENERAL RECOMMENDATIONS FOR IMPROVING SAFETY IN CONSTRUCTION INDUSTRY OF PAKISTAN

5.3.1 Role of Government of Pakistan

It is the sole responsibility of the concerned departments in Pakistani government to:

- a. Start enforcing existing regulations for labour through proper legislation to ensure that value of human life is taken seriously by spreading awareness about the rights of workers.
- b. Start a campaign on media so that public is aware of the rights of workers throughout the nation.
- c. Create an organization which maintain the quality and have a proper system of assessing that if safety policies are being proper implemented or not. This organization must be answerable to 'Ministry of Professional and Technical Training.'

5.3.2 Role of Pakistan Engineering Council

PEC may cooperate with this administrative department to:

- a. Create a manual of safety for the CI of Pakistan so that all construction companies are bound to follow the manual.
- b. Hold regular safety awareness training workshops.
- c. Include mandatory points for safety in order to complete the process of registration and renewal for construction companies.
- d. Create a mechanism to track safety performance on a regular basis:
 - i. First step is to maintain the proper documented records on all accidents and injuries happening on construction sites.
 - ii. Contractors must be held accountable for this document at the time of annual renewal of the firm. Also, this document must be published publicly to support the safety awareness campaign.

- iii. Set a criterion in which the clients allocate a specific percentage (5%) of the project cost to safety.

5.3.3 Role of Stakeholders in CI of Pakistan

All stakeholders have a very significant role in improving the standard of CI of Pakistan. For that some measures are suggested:

- a. Regardless of the timeframe and cost limitation on particular projects. Clients and contractors should regularly stress on the importance of the safety standards on the site.
- b. Only those plans and schedules of activities, should be approved by clients and contractors which meets the criteria of safety features.
- c. Workers may be supplied with basic facilities that include clean water for personal use.
- d. Trainings on safety should be made compulsory for all contractors and subcontractors.
- e. During the layout of site, all openings must be closed and properly labelled on signboards to avoid any mishaps.
- f. For every activity, it should be made compulsory for all construction companies to submit "safety policy," a "site emergency plan," to clients and the department of safety.
- g. Regardless of the scale of project, proper sign boards and safety precautions must be displayed in Urdu and English on every site.

5.4 IMPACT OF KNOWLEDGE

This research study is the latest of its class to assess the present condition of construction safety measures in Pakistan. It will undoubtedly benefit CI stakeholders in identifying flaws in their safety measures. Comparisons of safety procedures on massive projects that are still under development will encourage project owners to up their game in terms of safety performance. This initiative will undoubtedly contribute to the evolutionary process of shifting all stakeholders' mindsets toward investing in safety for increased productivity. Furthermore, CI will consider worker well-being and will begin to give value to life of human.

5.5 SUGGESTIONS FOR RESEARCH IN FUTURE

This research could be redone with a larger sample size and all of Pakistan's cities included. The sample group utilized in this research was enough for statistical analysis, however by boosting the sample size, this error can be reduced. Students may receive training at the university level regarding the evaluation of safety performance.



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APPENDIX A

QUESTIONNAIRE.

A.1 GENERAL INFORMATION

Subject: A Critical Assessment of Health and Safety Regulations and Trainings in the CI of Pakistan

General Information about the Respondent	
Personal Details: <i>(All the details will be kept confidential)</i>	
Name: (Optional)	
Name of Company:	
Telephone: (Optional)	
Email: (Optional)	
Please encircle appropriate category for each question below.	
Age (years)	1. Under 18 2. 18-25 3. 25-35 4. 35-50 5. 50+
Gender	1. Male 2. Female
Marital status	1. Married 2. Single
You belong to which stakeholder organization?	1. Client 2. Contractor 3. Consultant 4. Subcontractor
Position/Appointment	1. Site Manager 2. Site Engineer 3. Safety Inspector 4. Labour 5. Supervisor/Foreman 6. Safety officers
Experience in CI (years)	1. 0-5 2. 6-10 3. 11-15 4. 16-20 5. 20+
How long you have worked in this company (years)	1. Less than 1 year 2. 1-5 years 3. 6-10 years 4. 11-15 years 5. More than 15 years
Education	1. Below Primary 2. Primary 3. Secondary 4. Certificate/Diploma 5. College or Higher

A.2 SAFETY FACRORS QUESTIONNAIRE FORM

Safety Factors/Practices		Very Low	Low	Moderate	High	Very High
<i>Please encircle one box to indicate the level of performance of each safety practice in your company</i>						
1. Dedication of Management to safety						
01	Safety is the top priority for upper management	1	2	3	4	5
02	Safety is prioritized over time and there is work pressure on employees	1	2	3	4	5
03	Higher management/safety officials conducts regular safety inspections	1	2	3	4	5
04	Workers are encouraged to work within safety standards	1	2	3	4	5
05	Health and safety of employees is taken into consideration by Company	1	2	3	4	5
06	Giving reports on hazards are encouraged by the Field Engineer, Supervisor, and Safety Officer.	1	2	3	4	5
07	Any issue regarding safety is quickly taken into consideration by management.	1	2	3	4	5
08	Good communication between management and employees is established.	1	2	3	4	5
09	Management always makes sufficient manpower and equipment available to do the job safely.	1	2	3	4	5
2. Participation of Worker's						
10	Workers follow safety rules strictly.	1	2	3	4	5
11	Workers face strong reaction on violation of safety standards by other fellow workers.	1	2	3	4	5
12	Despite the fact that workers are not being supervised. All of them strictly follow rules	1	2	3	4	5
13	Safety rules are not taken serious by the workers.	1	2	3	4	5
3. Safety in the Contract Documentation						

Safety Factors/Practices		Very Low	Low	Moderate	High	Very High
<i>Please encircle one box to indicate the level of performance of each safety practice in your company</i>						
14	The contract strictly requires the contractor to add his "safety policy" for the project.	1	2	3	4	5
15	Before beginning each task, "safety plan." is required by contractor.	1	2	3	4	5
4. Safety Rules and Regulations						
16	In accordance with OSHA, the company has developed its safety policy.	1	2	3	4	5
17	A site emergency plan has been developed, and each task has undergone a job hazard analysis.	1	2	3	4	5
18	Regular safety audits are carried out.	1	2	3	4	5
19	On-site first-aid services are provided.	1	2	3	4	5
20	Workers are regularly medically examined.	1	2	3	4	5
21	Workers' compensation insurance is available.	1	2	3	4	5
5. Reporting & Accident Investigation						
22	There is a written mechanism for reporting and investigating accidents.	1	2	3	4	5
23	Accidents are always reported and documented.	1	2	3	4	5
24	Accidents are always investigated to determine what caused them.	1	2	3	4	5
25	Near misses are also investigated in order to reduce future risks.	1	2	3	4	5
6. Trainings on Safety						
26	New employees must complete mandatory training.	1	2	3	4	5
27	All employees receive refresher safety training on a regular basis.	1	2	3	4	5
28	Subcontractor employees are also given health and safety training.	1	2	3	4	5
29	Workers receive adequate job-specific safety training before beginning work.	1	2	3	4	5
30	An organizational chart presenting names, positions, and responsibilities for safety is clearly presented.	1	2	3	4	5
31	Posters of safety in English and Urdu are used at key locations to raise worker awareness.	1	2	3	4	5

Safety Factors/Practices		Very Low	Low	Moderate	High	Very High
<i>Please encircle one box to indicate the level of performance of each safety practice in your company</i>						
7. Meetings for Safety						
32	Weekly tool box meetings are held.	1	2	3	4	5
33	All progress and pre-construction meetings include a discussion of safety.	1	2	3	4	5
34	In safety meetings, Subcontractors take participation.	1	2	3	4	5
8. Worker incentives and disincentives						
35	Workers are being rewarded for the completion of tasks according to safety standards.	1	2	3	4	5
36	Those who violates safety rules are fined and training is given to them.	1	2	3	4	5
9. Use of Personnel Protective Equipment						
37	An efficient system for issuing, inspecting, and replacing personal protective equipment (PPE) is given by the company.	1	2	3	4	5
38	PPE available on site is of high quality.	1	2	3	4	5
39	It is mandatory to wear safety helmets when working on the site.	1	2	3	4	5
40	Hearing protection and safety glasses are used where necessary.	1	2	3	4	5
41	Workers at heights always wear a safety belt and a secure lanyard.	1	2	3	4	5
42	Where safety belts cannot be used, safety nets are used to prevent falls.	1	2	3	4	5
10. Storage, Sensation & Housekeeping						
43	Before beginning work, the site layout is planned, and materials are properly stored.	1	2	3	4	5
44	All openings and excavated areas are marked with flags or barricades.	1	2	3	4	5
45	Sharp edges are covered/protected.	1	2	3	4	5
46	Where necessary, arrangements for proper lighting are made.	1	2	3	4	5
47	A sufficient amount of water is provided for drinking and washing.	1	2	3	4	5
48	Wet spots and walkways or staircases are cleaned up on a regular basis.	1	2	3	4	5
49	Scrap is disposed of on a regular basis.	1	2	3	4	5

Safety Factors/Practices		Very Low	Low	Moderate	High	Very High
<i>Please encircle one box to indicate the level of performance of each safety practice in your company</i>						
50	There will be no careless throwing or dropping of materials or equipment.	1	2	3	4	5
51	On-site wind protection is provided to avoid any incident.	1	2	3	4	5
52	Ventilation is provided in tight spaces.	1	2	3	4	5
11. Scaffolding/Ladders Quality						
53	Scaffolds are used that are properly designed and fastened, and daily inspections are made.	1	2	3	4	5
54	On working scaffold platforms proper guard rails are installed.	1	2	3	4	5
55	On the construction site, good quality ladders with no broken rungs are used.	1	2	3	4	5
56	Before using Mobile Work Platforms (MWP), safety belts are always securely fastened	1	2	3	4	5
12. Precautionary Measures (Shoring and Excavation)						
57	Sloping or shoring is always used to prevent trench cave-ins.	1	2	3	4	5
58	Workers who are working in deep ditches are constantly monitored.	1	2	3	4	5
13. Using Hoists & Cranes						
59	Before using, hoist and cranes are carefully inspected.	1	2	3	4	5
60	Objects are carefully secured and fastened before lifting them up.	1	2	3	4	5

Any additional comments/suggestions:

Encircle the most appropriate option/category in the following questions

1. This project belongs to:-
 1. Public sector
 2. Private sector
2. How much amount is allocated in project budget for safety implementation and support?
 1. No budget allocated for safety
 2. Less than 1%
 3. 1-2%
 4. 2-4%
 5. 4-6%
 6. More than 6%
3. Tool box meetings are held regularly:

1. Daily
2. Twice a week
3. Weekly
4. Fortnightly (*once in 15 days*)
5. Never held

4. Which of the following post-accident safety response mechanism is usually followed on site:

1. Immediate organizational level action is taken (investigation, penalization, etc.)
2. Preventive actions are taken for avoiding similar occurrences in future
3. Only the accident is reported (no further action taken)
4. Only the site/ project manager decides the response mechanism

5. Who is responsible for the safety of employees in the contractor's organization?

1. Employees (themselves)
2. Field supervisor
3. Construction manager (site)
4. Project director (office)
5. Safety officer

Thanks for your co-operation

