

Assessing the level of the safety practice in construction companies in Palestine

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Abstract: Construction sites are generally complex and sometimes unsafe. They are still one of the most dangerous workplaces because of high incidence of accidents compared with other industries. This paper presents the results of a study undertaken to assess the level of the safety practice in construction companies in the Gaza Strip. The survey included fifty one construction companies that operate in the Gaza Strip. The results indicated that most of contractors in Palestine did not have a safety department, and did not have a safety manual. A large number of the respondent contractors have partial knowledge of safety. The opinion of the respondents' contractors regarding responsibility of the lack of safety is traced to company management. The majority of the respondents agreed that there is financial saving when complying with safety provisions. The results showed that the highest impact of the accidents on construction projects is on the cost of projects. It is recommended to strengthen the awareness and attitude of the top management and project managers towards the importance of safety. The managements of the company must establish and enforce safety polices for workers. They should develop their activities by including more monitoring of safety performance at the site and by giving more reliable feedback about the consequences that take place. Companies should hold their project management accountable for accidents.

Keywords: Safety, construction, management, cost.

تقييم مستوى تطبيق إجراءات الأمان في شركات المقاولات

الملخص: تعتبر مواقع البناء معقدة التركيب وأحياناً تكون بدون قواعد للأمان والصحة المهنية. وما زالت مواقع البناء من أخطر أماكن العمل بسبب نسبة الحوادث العالية مقارنة بالصناعات الأخرى. حيث يبين هذا البحث نتائج دراسة أجريت لمعرفة مستوى تطبيق إجراءات الأمان في شركات المقاولات في قطاع غزة وقد شملت عينة الدراسة 51 شركة مقاولات. وقد بينت نتائج الدراسة أن معظم شركات المقاولات لا يوجد لديها قسم خاص للأمان والصحة المهنية كما لا يوجد لديها دليل للأمان، كذلك أوضحت الدراسة أن عدد كبير من الذين شملتهم العينة لديهم معرفة جيدة بإجراءات الأمان، وقد رأى المشاركون في هذه الدراسة أن سبب ضعف نظم الأمان يرجع إلى إدارة الشركات. كما أشار معظم المشاركين في الدراسة أنه يمكن أن يكون هناك توفير في الميزانية إذا اتبعت الشركات نظم السلامة. هذا وقد خلصت الدراسة إلى العديد من التوصيات التي تهم قطاع المقاولات.

الكلمات المفتاحية: الأمان، الإنشاءات، الإدارة، التكاليف.

Introduction

All over the world, construction is one of the most hazardous industries due to its unique and dangerous nature. Safety has always been a persistent problem in the construction industry. In the United States of America (USA), it was reported that the construction industry accounted for 20% of all occupational fatalities, when they made up only 5% of the USA' work force [9]. In Kuwait, the industry accounts for 42% of all occupational fatalities [10] and in Hong Kong the industry accounts for more than one third of all industrial accidents over the last 10 years [15]. In Singapore, the construction industry takes up 29% of the total number of industrial workers, but the industry accounted for an un-proportionate 40% of the industrial accidents. These studies are among many others that show that the industry has a very poor safety performance record [1, 4, 7, 8].

Workplace fatalities and injuries bring great losses to both individuals and societies. Petersen [2] has summarized the problem in two points: (1) people are the fundamental reason behind accidents and (2) management is responsible for the prevention of accidents. The management failures represent the real and underlying causes of accidents [3, 4]. However, safety is not a luxury, and may be considered an important function to be used against unnecessary loss of property, injury, or death. Preventing occupational injuries and illness should be a primary concern of all employers. Especially in developing countries, there must be an effort to raise the level of awareness among both employees and employers of the importance of health and safety at work sites. Emphasis in both developing and developed countries should be placed on training and the utilization of comprehensive safety programs [5].

Little has been done in this field in Gaza Strip. There is a need to increase awareness and to exert pressure on companies for safety. Economical, social and governmental regulations are a few factors responsible for this increased pressure. This research is an attempt to assess the level of the safety practice in construction companies in the Gaza Strip.

Brief literature review

The advancement in social sciences has promoted a greater awareness of the sanctity of life and the unacceptability of premature death due to accidents. Accidents at construction sites are identified as a major problem throughout the world. According to reports published by the construction industry institute, injuries and fatalities occur in the construction industry at a rate more than 50% higher than all other industries [6]. In China construction industry the risk of a fatality is five times more likely than in a

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manufacturing based industry, whilst the risk of a major injury is two and a half time higher [14]. Unfortunately, it is not only construction workers who suffer from accidents but, on average, one member of the public, including children, is killed each month [7].

According to Agarwal and Everett [8], in the United States, the construction industry employs about 5% of the work force, but accounts for 11% of disabling occupational injuries and 18% of all occupational fatalities. These figures have changed in 1998 to be that construction industry employs about 6% of the work force, but accounts for 10% of occupational injuries and 21% of all occupational fatalities [9]. Research on risk management perceptions and trends in US construction, shows that safety is considered to be one of the highest risk allocations. By assigning safety the highest importance rating, contractors believe that they have and will continue to have sole responsibility for this risk in the future [10].

In their research on important criteria's for contractor selection Hatush and Skitmore [11] establish that, health and safety performance of contractors was among the top four important criteria's. Therefore, safety is a very important element in the success of any construction project. It has a major impact on the contractor, owner, workers, and on the environment. In many countries a contractor safety sheet or performance record is considered one of the items that qualify a contractor for a bid. Furthermore, many public agencies include safety standards as part of the construction contract documents, which then become a contractual obligation as well as a legal one. The contractor must be concerned about the safety for the following reasons: Humanitarian concern, economic considerations, legal consideration and company image [12].

However, safety is not a luxury, and may be considered an important function to be used against unnecessary loss of property, injury, or death. Preventing occupational injuries and illness should be a primary concern of all employers. Especially in developing countries, there must be an effort to raise the level of awareness among both employees and employers of the importance of health and safety at work sites. Emphasis in both developing and developed countries should be placed on training and the utilization of comprehensive safety programs [5]. A number of scholars have studied the factors affecting safety performance [7, 13, 3, 4, 14, 15, 16, 17, 18, 19, 20, 21, 10, 22, 23].

The construction industry in Saudi Arabia employs 15% of the total labour force and accounts for 14% of the total energy consumption in the country [13]. In Arabic region, construction safety conditions resemble those in developing countries. In the construction industry, the working environment

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is constantly changing, sites exist for a relatively short time and the activities and inherent risks change daily [10, 13]. It was found that higher frequencies of construction accidents occurred on projects that were over budget and those that were competitively bid [13]. Kartam et al [13] summarized safety problems in Kuwait as follows: competitive tendering; lack of safety regulations; small size of most construction firms; extensive use of subcontractors; lack of relevant accident data; extensive use of foreign labor; disorganized labor; high labor turnover; low priority of safety; seasonal employment and weather effect. Kartam et al [13] in his research did not mention management in safety problems in Kuwait. Jannadi and Bukhamsin [13] found that the most important three factors influencing safety performance are; (1) management involvement; (2) personal protective equipment; and (3) emergency/disaster planning and preparation. One of the most prevailing problems in Middle East counties is that workers and engineers receive almost no safety training and are mostly uninformed about the company's safety programs or policies [10].

Health and Safety in Gaza Strip is not widely recognized as inherent characteristic of construction projects. Contractors consider health and safety a legal requirement that means spending money without any profit, although a quick look at the cost of workplace injuries and the potential return on investing in accident prevention shows that a safe and healthy workplace can be a good profit. This situation resulted in the increased number of accidents. The accident rate in construction is highest when compared with other industries. Statistics have remained reasonably constant over the past six years, it has the construction industry generally accounting for nearly 20% of all industrial injuries [24]. Statistics also showed that more than one third of fatalities among workers were dead during the working in construction site. Falls and excavations were the main factors causes for the death of construction workers. The main causes of injuries in the Gaza Strip are classified into five categories, the categories are, falls, struck by falling object, struck by moving or stable object, caught in/between, machines, and others [25]. The absence of a unified set of safety regulations adversely affects the enforcement of safety on the job site.

Methodology

This research was conducted in Gaza Strip (including: Gaza city, north, middle and south area). It targeted contractors in various categories building, roads, and water sewage. The targeted contractors are classified under the first, second and third categories in the various types of works in Palestinian Contracting Union (PCU). Contractors that are registered under the fourth and fifth classes were neglected due to the low practical and

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administrative experience of their companies in construction works. The studied population was the contractors' companies that have a valid registration in the PCU in the following fields: building, roads, and water sewage.

This sample size that represents the targeted population was determined from following equation formula [26]:

$$n = n' / (1 + n' / N)$$

Where;

n' is the sample size from infinite population, which can be calculated from this formula

$[n' = S^2/V^2]$. The definitions of all variables can be defined as the following:

n : sample size from finite population.

N : Total population (150 contractors)

V : Standard error of sample population equal 0.05 for the confidence level 95 %.

S^2 : Standard error variance of population elements, $S^2 = P(1-P)$; maximum at $P = 0.5$

The sample size for the contractors' population has been calculated from the previous equations as follows

$$n' = S^2/V^2 = (0.5)^2/(0.05)^2 = 100$$

$$n = \left[\frac{100}{1 + \frac{100}{150}} \right] = 60$$

Based on PCU (2008) report, there are (220) classified companies, out of these (220) company there are (150) companies have classified (1st, 2nd, and 3rd) under (building, roads and water sewage works). These three categories were the target group of this research. Seventy questionnaires were randomly distributed, 51 questionnaires were returned showing (73%) response rate.

A pilot study was conducted to measure the validity and reliability of the survey and test the collected data. The pilot study was conducted by distributing the questionnaire to panels of experts having experience in the same field of the research to have their remarks on the questionnaire. Three experts representing two panels contacted to assess the questionnaire validity. The first panel, which consisted of two experts (contractors), was

asked to verify the validity of the questionnaire contents and its relevance to the research objective. The second panel, which consisted of one expert in statistics, was asked to identify that the instrument used was valid statistically and that the questionnaire was designed well enough to provide relations and tests among variables. Expert comments and suggestions were collected and evaluated carefully. Some minor changes, modifications and additions were considered to the questions and the final questionnaire was constructed.

A questionnaire was designed to assess the perceptions of local contractors towards safety practice in construction projects. The questionnaire was distributed to random sample of contractors working on construction projects in the Gaza Strip. Responses to the questionnaire were collected and analyzed.

Results and discussion

Respondents' characteristics

The results obtained from the questionnaire shows that, the fifty-one companies participated in the study located in Gaza city, Der-Elbalah, Khanyounis and Rafah cities in the Gaza Strip. The following section will describe the characteristics of the respondents that participated in this survey. These characteristics also include the companies' categories, experience and size of the companies.

Job title of respondents

As shown in Figure 1, 31 % from the sample was project managers, 59 % from the sample was site engineer, and 6 % was executive director while 4 % from the sample was chairperson of the board.

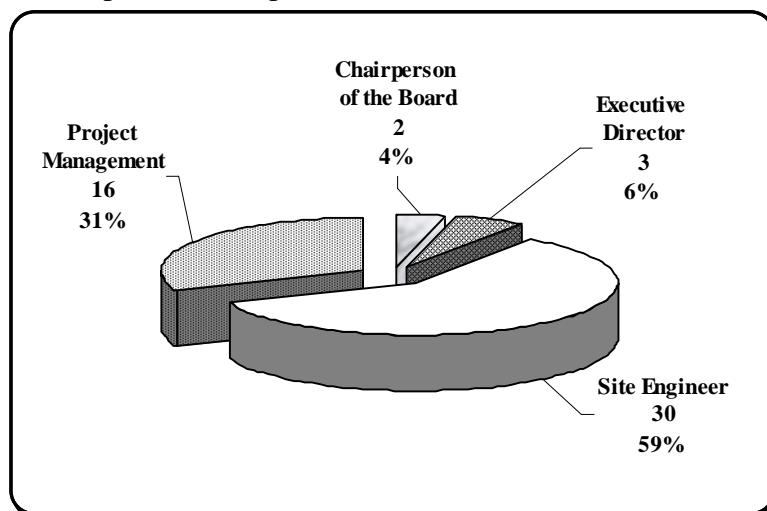


Figure 1: Job Title of Respondent

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Classification and categories of construction companies

The contractors were classified based on their categories and their type of work in the Palestinian Contractors Union (PCU) in the Gaza Strip. Three categories (building, roads and water sewage) were targeted in this study. Table 1 presents the data related to the 51 participated companies concerning their classifications and categories.

Table 1: Classification and Categories of Participating Construction

Company	Classification					
	Building		Roads		Water Sewage	
Category	Frequency	Percent %	Frequency	Percent %	Frequency	Percent %
First	21	41.2	13	25.5	14	27.5
Second	17	33.3	16	31.4	15	29.4
Third	14	27.5	22	43.1	22	43.1
Total	51	100.0	51	100.0	51	100.0

Building category

Table 1 show that 41% of the companies classified first degree, 33% of the companies classified second degree, and 28% of the companies' classified third degree.

Roads category

Table 1 shows also that 26% of the companies classified first degree, 31% of the companies classified second degree, and 43% of the companies' classified third degree.

Water sewage category

Table 1 illustrates that 28% of the companies classified first degree, 29% of the companies classified second degree, and 43% of the companies classified third degree.

Working experience for company

Working experience is measured in the number of years a company has been operating in the construction industry. The majority of the surveyed companies "78%" have been active the construction business for more than 5 years; it was sum of (29.4, 33.30, and 15.40). Figure 3 shows the working experience of companies in the construction field.

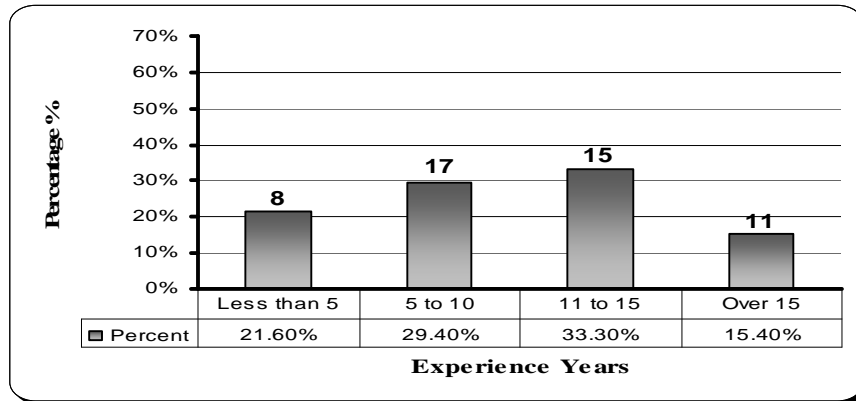


Figure 2 Company Experience in the Construction Field

Working experience for respondent

The years of experience vary from less than 5 years to more than 15 years. Most of the respondents (56.9%) have less than 5 years experience in the construction field, and 43.1% from the sample have over 5 years experience in the construction field. Figure 3 shows the working experience of respondents in the construction field.

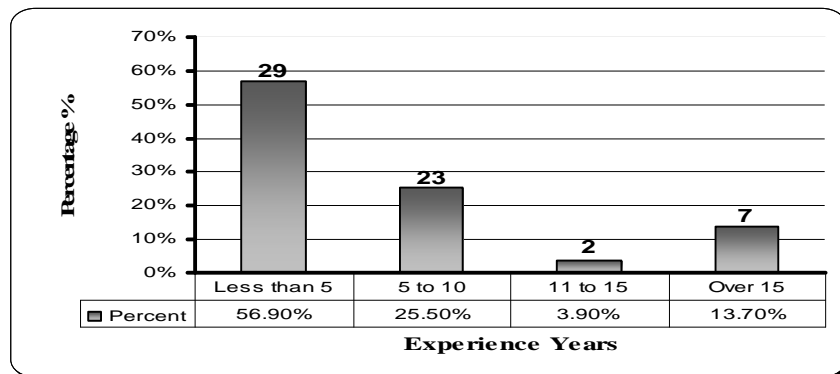


Figure 3 Workers Experience in the Construction Field

Respondents' age

Figure 4 shows that the majority of respondents 66.7% are of the age between 25 years to 34 years old. This is the appropriate age for a graduate engineer to work and start professional life. 9.8% of the respondents are more than 45 years old.

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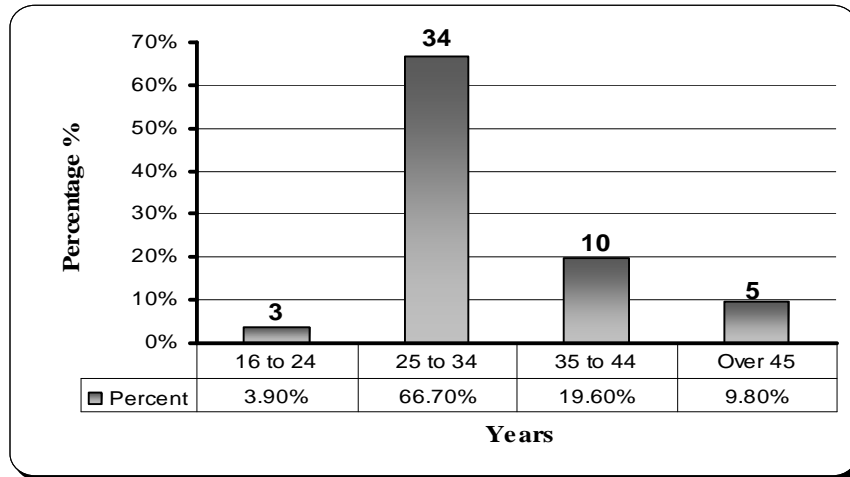


Figure 4 Respondents Age

Qualification of Respondent

Figure 5 shows that the majority of respondents (68.6%) have BSc degree while only 13.7 % hold Master degree, it is understood that this situation is natural because most of respondents as shown in Figure 4 are young (their ages range between 16 to 34).

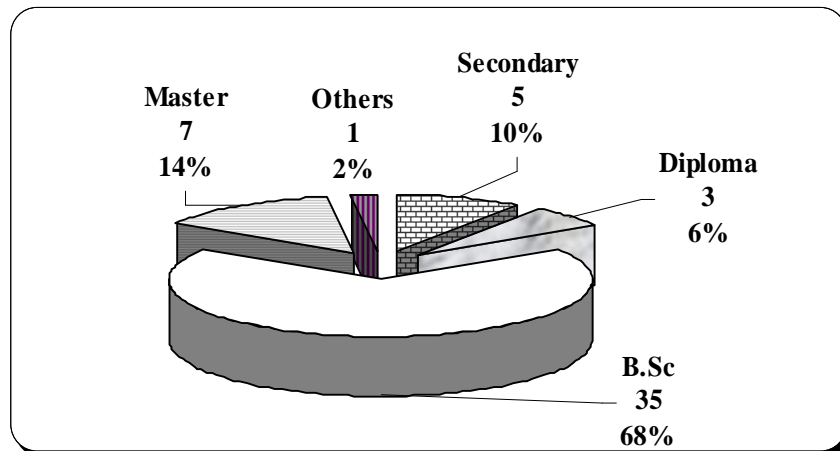


Figure 5 Qualification of Respondent

Company size

Company size measured in the number of workers a company is employing. The companies that have less than 50 workers represent 66.7% of the total participated companies and that which have more than 300 employees represent 3.9 %. Figure 6 shows the size of company in terms of Number of workers.

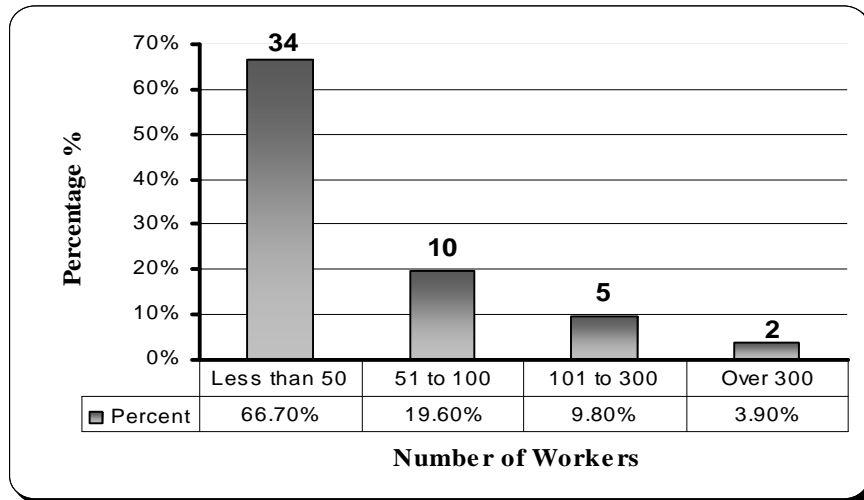


Figure 6 Company Size

Safety practice and perception

In this section, the results were concerning respondent’s safety practice and perception. The respondents were requested to give information about their perception towards safety.

Availability of safety professional / department

The respondents were asked if their companies have a safety professional and or safety department. As shown in Figure 7, 86% of the respondents did not have a safety professional or safety department while the remaining 14% had safety department.

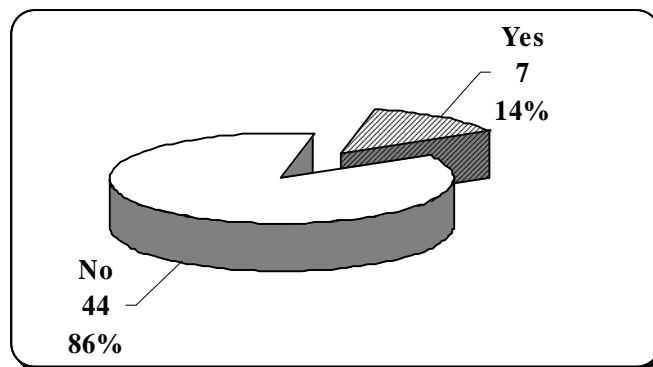


Figure 7 Availability of Safety Professional / Department

Using safety program or manual

The respondents were asked if their companies use a safety program or manual. As illustrated in Figure 8, about 9.8 % of the respondents are using a safety program or manual. The respondents, which are partially using a

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program, represented about 34.9%. The remaining 55.3% of respondents are not using a safety program at all.

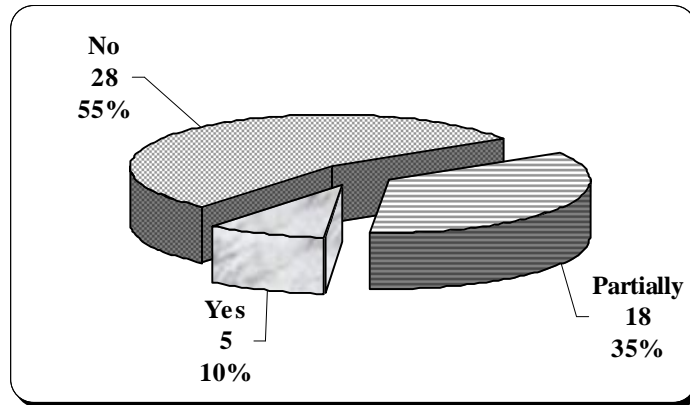


Figure 8 Using of Safety Program or Manual

Safety knowledge

The respondents were asked if they have knowledge about the safety conditions, specifications and provisions. As indicated in Figure 9, 37.3 % of the respondents agree that they have knowledge of safety. While 54.9 % of the respondents agree that they have partially knowledge of safety. Only 7.8% of respondents feel that they did not have sufficient knowledge of safety.

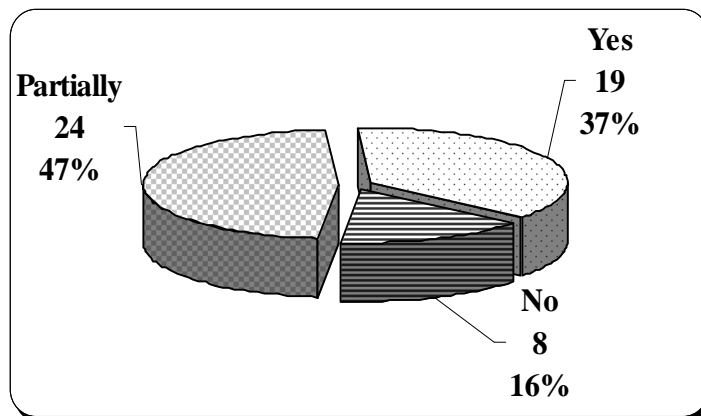


Figure 9 Safety Knowledge

Responsibility of safety lacking

The respondents were asked about their opinion on responsibility of lacking safety during the construction on site. The parties that have the main responsibility for lacking of safety on site according to the respondents are site engineer (21.10%), safety engineer (18.35%) and the management (30.28%). 12.84% of the respondents have view that the worker is

responsible for lacking of safety on site (Table 2). 11.93 % of respondents feel that the government has the responsibility. Only 5.50 % from the sample agree that the responsible for lacking of safety during construction on "Others".

Table 2 Responsibility of Safety Lacking

Responsibility of Safety Lacking	Frequency	Percent %
Top Management	33	30.28
Site Engineer	23	21.10
Safety Engineer	20	18.35
Worker	14	12.84
Government	13	11.93
Others	6	5.50
Total	109	100.00

Financial saving

The respondents were asked if they expected any financial saving by complying with safety provisions. As shown in Figure 10, 37.3% of the respondents agree that there are financial saving when they take safety precautions into consideration as this will reduce the accidents rates. Nearly 47.1% feel that sometimes there are savings. Only 15.7 % of the respondents disagree that there are financial saving by complying with safety provisions.

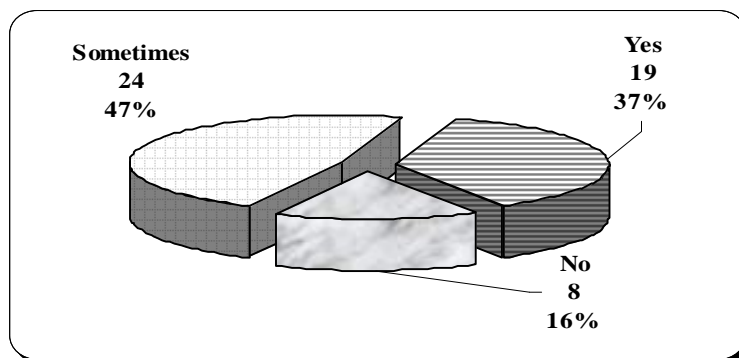


Figure 10 Financial Saving

Impact of accidents

It can be observed (Table 3) that, the highest impact of the accident at the project is shown in the financial direction. The results illustrate that, around 90% (27.5% + 60.8%) of the respondent have a strong satisfaction that the

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accidents will lead to increase the project's cost. This was ranked in the first position with RII of (0.816).

Table 3: Impact of Accidents

Impact of Accidents	Percentage of Occurrence					RII	Rank	t - test	p - value
	Very High	High	Moderate	Low	Very Low				
Increase on cost	27.5	60.8	3.9	7.8	0.0	0.816	1	9.674	0.000
Impairing reputation of companies	33.3	49.0	2.0	15.7	0.0	0.800	2	7.141	0.000
Imposing psychological burden on workers	19.6	56.9	11.8	11.8	0.0	0.769	3	6.840	0.000
Interrupting project's schedule	11.8	45.1	15.7	25.5	2.0	0.678	4	2.643	0.011

“Impairing reputation of companies” was ranked the harmful impact of the accident rate at the company's reputation. The respondent's satisfaction that more accidents in the project will reflect unstable construction projects, which give warring impales at the project success. This impact at the accident rates at the company's reputation was ranked in the second highest position with RII of (0.80).

The results reflect also, that, occurrence of accidents in construction may influence the schedule arrangement to complete the projects. ”Interrupting project's schedule” was ranked in a low influence position at the construction projects with RII of (0.678). The overall results will show clearly that the highest harmful impact from contractor's point of view is traced towards the financial direction, which turn influence other areas. In general, such accidents in construction projects will have negative impact at the sustainability of the project.

Conclusion

The results indicated that, the majority of the companies that were analyzed have not a professional safety and/or department, while some have such section. The participated companies in this survey are not using a safety program or manual. The parties that have the main responsibility of lacking safety during the construction in site according to the respondents are management, site engineer and safety engineer respectively. Worker came after the above parties in responsibility of safety lacking.

The majority of the respondents agreed that there is a financial saving by complying with safety provisions. On the other hand, the most significant impact of site accidents on construction companies is increase on cost. The

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other significant are impairing reputation of companies, imposing psychological burden on workers and interrupting project's schedule that means the respondents were in general more concerned about the cost, rather than internal distress of company image, the morale and the humanitarian aspect, and time.

It is recommended to strengthen the awareness and attitude of the top management and project managers towards the importance of safety. The managements of the company must establish and enforce safety polices for workers and should develop their activities by including more monitoring of safety performance at the site and by giving more reliable feedback about the consequences that take place. Companies should hold their project management accountable for accidents.

The government and the engineering societies should play a major role to apply the safety rules by issuing the regulations, standards and codes and legally enforced the companies to follow them with adequate strict penalties for non-compliance. Safety performance indicator for the construction companies identified by this study should be adopted and such indicators should be established for other different grades with regular updating. A safety provision should be stated in construction contracts. It should also be taken into consideration in the tendering stage. An adequate budget should be assessed to safety implementation.

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