IMPROVING SAFTEY PERFORMANCE IN CONSTRUCTION PROJECTS IN LIBYA (CASE STUDY : IN TRIPOLI CITY)

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Abstract

In both developed and developing countries, the construction industry is considered to be one of the most significant industries in terms of its impact on health and safety of the working population. Construction industry is both economically and socially important. However, the construction industry is also recognized to be the most hazardous. The objectives of this research are to investigate the safety performance in the construction sites. The data were collected from the contractors, consultant, and owners by using questionnaire to evaluate the safety performance in the construction sites. In total, there were 40 questionnaires which were distributed to respondents, with a response rate of 75%. The results show that there was still a lack of commitment from the government, the insurance company, the labor ministry, the owners, consultants, and also the contractors to improving safety performance on the construction sites.

The suggestion is to improve the safety performance on the construction sites. The government should follow up the safety performance by visiting the construction sites. The insurance company should be more active in visiting the construction sites. The owners should be more active towards the safety by controlling, visiting the process in the construction sites. The contractors have to train the workers and promote the safety culture and follow up the safety performance. The consultants should control all the tools in the construction sites to insure that those tools are safe.

Keywords: Safety performance, construction project, Tripoli

ABSTRAK

Baik di negara-negara maju maupun di Negara berkembang, industri jasa konstruksi dianggap sebagai salah satu industry yang memiliki dampak paling besar terhadap kesehatan dan keselamatan pekerja. Industri jasa konstruksi sangatlah penting secara social-ekonomi. Akan tetapi industri ini juga dikenal sebagai yang paling berbahaya. Tujuan dari riset ini adalah untuk menganalisa sisi keamanan kerja di lokasi proyek. Data-data dikumpulkan dari para kontraktor, konsultan dan pemilik perusahaan dmenggunakan kuesioner untuk mengevaluasi catatan keamanan kerja di lokasi konstruksi. Secara keseluruhan ada 40 kuesioner yang disebar, dengan tingkat pengembalian sebesar 75%. Hasil analisis menunjukkan masih kurangnya komitmen dari pemerintah, perusahaan asuransi,kementrian tenaga kerja, pemilik perusahaan, konsultan dan para kontraktor untuk meningkatkan keselamatan kerja di lokasi konstruksi.

Rekomendasi yang bisa diberikan adalah agar keselamatan kerja di lokasi konstruksi bisa ditingkatkan. Pemerintah harus mendorong perbaikan dalam hal keselamatan kerja dengan mengunjungi lokasi-lokasi proyek konstruksi. Perusahaan asuransi harus lebih aktif mengunjungi lokasi proyek. Pemilik perusahaan harus juga lebih proaktif dalam hal keselamatan kerja dengan mengunjungi dan mengontrol proses-proses konstruksi di lokasi proyek. Para kontraktor sendiri harus member pelatihan pada para pekerjanya dan menggalakkan budaya kerja yang aman serta meningkatkan keselamatan kerja. Para konsultan harus mengontrol semua peralatan di lokasi proyek untuk memastikan alat-alat tersebut aman dipakai.

Keywords: Keselamatan kerja, proyek konstruksi, Tripoli

LIST OF ABBREIATIONS

(OHS)	Occupational health and safety
(OHSA)	Occupational health and safety administration
(UNDP)	Organization work with government in Palestine
(UNRWA)	Organization work with government in Palestine
(UAE)	United Arab Emirates
(UK)	United Kingdom
(USA)	United States American
(HSE)	Health and safety Executive

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CHAPTER I

INTRODUCTION

1.1. Background

In the developed as well as developing part of the world, construction industry is considered to be one of the most significant industries in terms of its impact on health and safety of the working population. Construction industry is both economically and socially important. However, the construction industry, at the same time, is also recognized to be the most hazardous (Suazo and Jaselskis.1993), in Farooqui (2008). Although dramatic improvement has taken in recent decades, the safety record in the construction industry continues to be one of the poorest (Farooqui, 2008).

The prevention of construction accidents usually entails predicting future accidents and their nature under given circumstances. The making of such predictions is based on knowledge about past accidents. The major causes of accidents in the construction industry are related to the unique nature of the industry, human behavior, difficult work-site conditions, and poor safety management which result in unsafe work methods and procedures.

Due to the fact that accident rates in construction are high when compared to other industries, the construction and projects managers need to be fully prepared to deal with accidents when they occur, undertaking proper investigations and reporting procedures afterwards. Accident statistics represent not only terrible human tragedies but also substantial economic costs. This is because accidents cause damage to plant equipment and the loss of productive work time until the normal site working rhythm and morale are restored. Accidents can also cause work disruption and reduce the work rate (Enshassi et.al. 2007).

The major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures. Emphasis in both developing and developed

countries needs to be placed on training and the utilization of comprehensive safety programs (Farooqui, 2008).

Hazard has been defined as a real or potential situation that may cause unintentional injuries or deaths to people; or damage to, or loss of an item or belongings. It can be regarded as the counterpart of safety. Therefore the evaluation of the workplace safety can be conducted by evaluating all on-site hazard elements. Safety performance of each element can then be measured by evaluating the correspondent on-site hazard factors. With the decrease of its potential hazard, its safety performance improves (Fang et al. 2004).

1.2 Feature of construction industry in Libya

The construction industry in Libya and especially in the Tripoli city, by its inherent nature and tremendous infrastructure, is susceptible to potentially dangerous conditions that affect the safety of all personnel working on construction projects and the company. Thus there has been an increase in the number of accident, death and injury during the last five years.

Generally, the image of the construction industry in Libya needs improvement. That is why many native Libyan people do not like working in the construction industry; hence the majority of construction workers are imported from many other countries, especially the neighboring Egypt and Tunisia. People even can see the poor safety conditions on the field and witness accidents there. This bad condition in the construction industry in Libya has occurred for a long time.

But there are also factors affecting the construction safety in Libya, especially in the Tripoli city, in the negative way, such as the severe competitive tendering methods, the age of the workers, experience, the lack of training on workers and the main concern of the management on productivity with ignorance of safety issues. Safety is one of the obstacles in the direction to developing the construction industry in Libya. The concern should be addressed along the way to improve the safety performance in the construction industry in the Tripoli city.

1.3 Aim of Study

The aim of this study is to examine the safety performance of the construction projects in the Tripoli city.

1.4 The objectives of Study

The objectives of the study are:

- To realize the real safety problems and danger of injuries that occurs in Libya, especially in the Tripoli city.
- To investigate safety procedures, regulations, policies, and accident prevention methods related to the construction projects in the Tripoli city.
- To provide methods and suggestions to improve the safety performance in construction projects in the Tripoli city.

1.5 Research Significance

Construction accidents have been causing many human tragedies, loss of life, productivity, and delay projects. The main reason for selecting this topic was the need for improving safety performance in the Tripoli city other reasons for would be:

- The lack of studies about the safety issues of construction professionals in Libya especially in the Tripoli city.
- To provide some ways to help companies for improve safety performance on the construction sites.

1.6 Structure of the dissertation

Chapter 1: Outlines the by giving information of the area, and the objective of study and the research significance and expected outcomes also structure used for the presentation of the dissertation.

Chapter 2: Reviews the nature of accidents, and the global construction safety performance scenario, and construction safety performance in developing countries, and methods used to improve safety performance in the constructions industry.

Chapter 3: The methodology use of the research. The data collection will mainly depends on designing a questionnaire. The respondents will be owners, consultants, and contractors. The data will then be analyzed by using descriptive methods.

Chapter 4: Results.

Chapter 5: discussion.

Chapter 6: Conclusion and recommendations.

CHAPTER II

LITERATURE REVIEW

This chapter will discuss the nature of accidents, the global construction safety performance scenario, construction safety performance in developing countries, and methods used to improve safety performance in the constructions industry.

2.1 Introduction

The safety performance of the construction industry has been improving. Health and safety has been recognized as an important business performance subject (Myers, 2003; Wilson and Koehn, 2000). The factors causing construction site accidents have been addressed by several researchers. Toole (2002) listed the main causes of construction accidents. These are lack of proper training, deficient enforcement of safety, lack of safety equipment, unsafe methods or sequencing, unsafe site conditions, not using provided safety equipment, poor attitude toward safety, and isolated, sudden deviation from prescribed behavior.

The state of the safety in the construction industry in Tripoli is poor. In the past five years, the numbers of people injured or even died in the construction projects has been increasing. This is due to the fact that in Tripoli, there has been a tremendous infrastructure building projects. After the lifting of the economic sanction from the West, Libya has enjoyed a rapid economic growth supported mainly by its oil wealth. Thus the Libyan government initiated a major infrastructure building projects.

The authority, however, has not been able to keep up with the huge increase in number of construction projects. Many safety issues in the construction projects were overlooked by the authority due to ignorance. This is because the main concern for the authority there has been how to finish as many projects possible to make up for the lost time the country suffered as results of the economic sanctions. Other factor for the negligence of safety in the Libyan construction industry is the fact that most construction workers are foreign nationals from

other countries, hence there is little pressure from the local population on the government to address this issue.

2.2 Construction Accidents

The importance of the use of plant and equipment in construction works seems to be increasing on daily basis. Manual methods are fast giving way to mechanical methods in the effort to increase productivity, meet increasing complex specifications, construct or actualize the growing complexity of modern designs, utilize the numerous new construction materials that are being introduced into the industry, meet the tight schedules and targets placed by clients' demands, implement control measures required to bring projects on track and ensure effective and efficient utilization of the numerous resources involved in the construction of projects. New plant and equipment are being developed and produced regularly in response to the needs of the industry. Seeley (1996), in Godwin (2011). Asserts that increases mechanization of construction work can speed up construction and reduce the overall cost of construction. In appreciation of the important role that plant and equipment play in achieving project objectives, clients are placing greater emphasis on the use plant and equipment even that before by identifying possession of plant and equipment of prospective contractors as a major criterion for the award of contracts. In response to this development, contractors often embark on efforts to own construction plant and equipment in order to be able to compete favorably with their counterparts during tendering. They do not stop there; hay also stipulate mechanized methods in their production methods statement during tendering. They are also competed to implement the methods stipulated in their tenders when eventually contracts are won and have to be executed.

Mechanization goes with hazards as the use of plant and equipment is prone to accidents and injuries. Research studies have confirmed that the construction industry is one of the most hazardous industries all over the world (Kartam, 1997), in Godwin (2011). In most countries, the rates of accident and injury prevailing in the industry are higher that what prevail in other industries. For developed countries, loushine et al. (2003), in Godwin (2011). Discovered that the United States construction industry currently accounts for over 22% of all occupational fatalities in the entire United States even though it employs less than 7% of the

country's workforce, HSE (2009), in Godwin (2011). reports that Britain's construction industry, which is one of the biggest industries as it provides employment for 2.2 million people, is also one of the most dangerous recording over 2,800 deaths from injuries received at work in the last 25 years. The situation in developing countries is worst because research studies discover that accident and injury rates in many of the developing countries such as Nigeria (Idoro, 2004 and 2007), in Godwin (2011). Thailand (International Labour organization, 2005), in Godwin (2011).And Tanzania are considerably higher than in European countries. Mbuya and Lema (2003), in Godwin (2011). Opine that in most developing countries, safety consideration in construction projects delivery is not given a priority and the employment of safety measures during construction is considered a burden. Enhassi et al. (2008), in Godwin (2011). Also discover that in many developing countries, the legislation governing OHS is significantly limited when compared with UK. They report further that there are rarely any special provisions for construction on workers' safety and the general conditions for workers are often not addressed. Lee and Halpin (2003), in Godwin (2011). Earlier discovered that in many of the countries where safety legislation exists, the regulatory authority is weak and non-existent and employers 'pay lip service 'to regulations. Koehn et al. (2003), in Godwin (2011). Further discover that in developing countries, injuries are often not reported and the employer only provides some form of cash compensation for an injury to the employee. This phenomenon has several implications on the construction industries of developing countries. Rowlinson (2003), in Godwin (2011). Observes that the cost of accidents accounts for 8.5% of the total tender price in the Chinese construction industry. The Nigerian construction industry shows almost all the features discovered about developing countries. The industry has no legislation governing OHS, on regulatory authority on OHS, accident and injuries are not reported and clients, consultants and contractors give little or no attention OHS. The resulting implication is high incidences of accidents and injuries (Godwin 2011).

2.3 Global Construction Safety Performance Scenario

In developed countries, recent advancement in technology, on one hand, has contributed positively to industry productivity, but on the other hand, has created a more challenging and unsafe work environment (Farooqui et al.,2007), in Farooqui (2008).

According to research findings, those who spend their working lives on construction sites have 1 in 300 chance of being killed at work. The chance of being disabled by injury or serious illness is much greater than in most other industrial fields. Every construction worker is likely to be temporarily unfit for work at some time as a result of a minor injury or a health problem after working on a construction site (Ahmed et al., 2000, in Farooqui (2008).

Alazeb (2004), in Hassouna (2005).Stated that being struck by an object, falling at ground level, and being hit by falling objects were the most common reason of accidents leading to injuries in Egypt, and a study of Zeng et al. (2008) has pointed out that some accidents such as falling from height and hit by falling materials were the most common reason of accidents leading to injuries in Chinese.

Rowlinson (2003), in Farooqui (2008).Reported that between 1989 and 1992, 256 people were fatally injured in the Australian construction industry. Statistics revealed that the fatality rate was 10.4 per 100,000 workers, which was similar to the fatality rate for road accidents. In 2000, a study was conducted in China Huang et al. (2000), in Farooqui (2008). Revealed that 3,000 construction workers are killed in work related accidents each year. In Hong Kong, 275 reportable accidents per 1,000 workers per year were recorded in 1994; this figure stood at around 150 in 2000 (Rowlinson, 2003), in Farooqui (2008). In comparison, 10 construction workers in every 1,000 suffer an injury in a year in Japan, and the figure is around 50 for the United Kingdom (Rowlinson, 2003), in Farooqui (2008). A study of the Egyptian construction industry concluded that safety programs applied by contractors operating in Egypt were less formal and the accident insurance costs were fixed irrespective of the contractors' safety performance (Farooqi et.al 2008).

Table 2.1 compares the fatality rates in global scenario of all industries to that of construction industry in 2002.The table clearly indicates the unsafe nature of the construction industry.

Table 2.1 Fatality rates in selected countries in 2002 (Death/100,000 employees).

Country	All industry	Construction
Australia	2.0	5.0
Canada	6.1	20.9
Hong Kong	8.6	64.2
Sweden	1.4	5.0
United Kingdom	0.7	4.4

2.4 Construction Safety performances Scenario in developing countries

Construction in developing countries, such as Pakistan and India, is more labor intensive that in the developed areas of the globe, involving 2.5-10 times as many workers per activity (Koehn and Regmi 1991), in Farooqui (2008). Typically workers tend to be unskilled and migrate in a group, with or without their families, throughout the country in search of employment. In fact, they are usually divided into various factions. Communication problems related to difference in language, relation and culture tend to inhibit safety on the work site.

In Pakistan, there is a significant difference between large and small contractors. Most large firms do have a safety policy, on paper, but employees in general are not aware of existence. Nevertheless, a number of major constructions exhibit a concern for safety and have established various safety procedures. They also provide training for workers and maintain safety personnel on the jobsite. For the majority of contractors, however, maximizing profit is the prime concern. Unsafe conditions exist on many sites, both large and small, and laborers are subjected to numerous hazards.

On many sites, no training programs for the staff and workers exist; therefore no orientation for new staff or workers is conducted, hazards are not pointed out, and no safety meetings are held. Employees are required to learn from their own mistake or experience. In addition, lack of medical facilities, shanty housing, and substandard sanitation tend to exist on remote projects. Workers undertake a risk while at work and the following problem areas are common:

- While excavating in deep trenches (with no proper shoring or bracing), accidents due to cave-ins often occur.
- Concreting is done mainly by laborer, and cements burns due to the unavailability of protective gloves and boots are common.
- Workers fall from heights due to weak scaffolding and the unavailability of safety belts.
- Workers sustain injuries on the head, fingers, eyes, feet, and face due to absence of personal protection equipment.
- There is improper housekeeping.

Lack of understanding of the job and poor equipment maintenance are also major causes of accidents.

Injuries generally are unreported; however, if necessary, a laborer might receive first aid or preliminary medical care. In most cases, specialized medical treatment or compensation is unavailable. Workers themselves consider accidents as due to their own negligence, and accept that construction is a dangerous occupation. Nevertheless major accidents involving the death of a worker may be reported due to the financial expenses and litigation that could be involved.

Maintenance and inspection schedules often are not followed, and only after a breakdown is equipment repaired. This approach leads to loss of time, idle workers, and projects delays. It may also cause damage to property. Breakdown of concrete mixers, vibrators, water pumps, and tractors are common. Electrocution is also a major hazard, due to use of substandard electrical equipment and underground cables. Workers, especially young ones, take chances, and often do not follow safety norms or use personal protective equipment. Also laborers and staff are sometime are under the influence of alcohol and drugs. Unfortunately, crew members are not checked for drugs and alcohol before the start of and during work.

One of the impeding factors that prevent Pakistan from developing a construction safety program is pervasive corruption, a by –product of the system of bureaucratic controls. As an example, for any accident that takes place on-site due to lack of safety practices, the

particular low-level activity supervisor (engineer/technician), not the construction manager, is theoretically held responsible and may, in exceptional cases, be subject to physical abuse harm from the victim's group of friends. In extreme circumstance, the supervisor may also be charged with a criminal offence. However, cash payments are usually accepted in lieu of pressing charges. In addition, because workers are usually non-residents of the local area and are often unaware of their rights, accidents are often not reported to the proper authorities or, if reported, are lost in the local bureaucracy.

Owners and consultants do stress safety before work commences, but as the work progresses their concerns for deadlines becomes a priority and they tend to pay less attention to safety. On large projects, the owners may provide medical facilities at the site, but ultimately safety is the contractors' responsibility.

According to the survey conducted by Farooqui et al. (2007), in Farooqui (2008). the major injuries faced by contracting firms in Pakistan on their projects site, in descending order of occurrence, were given as follows:

- Fall injuries.
- Struck by wastage and raw materials.
- Heat stroke.
- Head injuries.
- Eye injuries.
- Burning cases.

In the same study, some informal assessments identified a few major reasons for safety non-performance which included:

- Lack of development of construction sector in the shape of mechanization and industrialization.
- Lack of professional construction management practice, inadequate safety provisions laid by the existing regulatory environment which has failed establish safety a s major industry objective ,insufficient and incentive –less insurance mechanisms which have failed to establish safety as a business survival issue, and unfavorable business

environment which has led to adversarial business relationship among stakeholders resulting in controversies, conflicts, claims and litigation and hence diverting the focus from issues like safety (Farooqui et.al 2008).

2.5 Safety Management

Management and planning is one way to avoid unplanned events. Since accidents are unplanned events, an effective safety management can help avoid job injuries. Safety management must be through, and it must be applicable to all aspects of the job, from the estimating phase of the project until the last worker has left the premise at the completion of the project. All parties to a construction project must be included in some way in the safety program every party is responsible.

In Australia, almost all respondents agreed with the statement ‘’safety is the responsibility of both management and the worker together’’ Williamson, et.al (1997), in Hassouna (2005). Kartam, et.al (2000), in Hassouna (2005).Concluded in their study that owners, as part of his safety responsibly, must ensure that the designs safe projects. He also ensures that the contractor has a safety program. The owner should include the safety program as an element of the bidding technicalities.

Tam, et. Al, (2004), in Hassouna (2005).Identified that poor safety awareness of firm’s top leaders and poor safety awareness of projects managers were the main factors affecting construction safety performance in China. Jannadi et.al,(1998) in Saudi Arabia stated that the responsibility for safety on any construction projects should be shared between all the parties involved in the projects, namely, the owners, the designer or architect and the contractor.

Tam et al (2004), in Abdul Rehim (2008). Did a study in China and noticed that the causes of accidents were due to poor safety awareness from top leaders; lack of training; poor safety awareness of managers; reluctance to input resources for safety; reckless operation; lack of certified skill labor; poor equipment; lack of first aid measures; lack of rigorous

enforcement of safety regulation; lack of organizational commitment; low education level of workers; poor safety conscientiousness of workers (Abdul Rehim et.al 2008).

2.6 Safety Program

Sawacha et al. (1999), in Aksorn (2009). uncovered that a safety program that has the most effect on site safety consist of management talks on safety, provision that has the most effect on site safety consists of management talks on safety, provision of safety booklets, provision of safety equipment, providing a safe environment and appointing a trained safety representative on site (Aksorn et al.2009).

Hinze and Harrison (1981), in Hassanien (2007). Surveyed the nature of safety programs in the largest 100 construction firms in the USA, and concluded that larger firms had more formal safety programs. They also had the safest performance. Lower injury rates were in companies that provided workers with formal safety orientation; companies that gave incentives to workers and foremen and companies that employed full time safety representatives. Safer performance was noted to occur when safety representatives were hired and trained by safety directors (Hassanein et al. 2007).

The studies conducted by Tam et al. (1998), in Aksorn (2009). And Poon et al., (2000), in Aksorn (2009). To evaluate the influence of safety program on improved construction safety performance revealed that successful safety program, however, do not need extensive elements, but should at least include the critical elements including safety policy, safety committees, safety inductions, safety training, and safety inspections (Aksorn et al. 2009).

2.7 Safety Policy

Evelyn, Florence and Adrian (2005), in Hassanein (2007). Presented the results of a postal survey of contractors in Singapore. The findings revealed that site accidents are more likely to happen when there are inadequate company policies (Hassanein 2007).

The health and safety policy statement should contain the aims which are not measurable, and objectives which are measurable of the organization or company. Aims will probably remain unchanged during policy revisions, whereas objectives will be reviewed and

modified or changed each year. The statement should be written in clear and simple language so that it is easily understandable (Phi Hughes et.al 2001).

The following points should be included or considered when a health and safety policy statement is being drafted:

- The aims should cover health and safety, welfare and relevant environmental issues.
- The position of the senior person in the organization or company who is responsible for health and safety (normally the chief executive).
- The names of the health and safety adviser and any safety representatives.
- A commitment to the basic requirements of the health and safety at work Act (access egress, risk assessments, safe plant and systems of work, use handing, transport and handing of articles and substances, information, training and supervision).
- Using a safety committee or plant council.
- Specific policies of the organization (violence to staff).

2.8 Cost of Safety

Rowlinson (2003), in Godwin (2011). observes that the in the construction projects the total cost of accidents accounts approximately 8.5 % of the total tender price in the Chinese construction industry (Godwin et al., 2011). Hassouna (2005) found in Palestine the cost of safety depends on the size of projects, and natural of projects.

In Kuwait, many managers think that safety procedures substantially increase the cost of construction (Kartam et al, 2000), in Hassouna (2005). They also found that accident costs and safety procedures are not considered in the contractors' bid and only the insurance cost is considered for those items in Kuwait. The responded managers in the Kartam et al. (2000), in Hassouna (2005). Survey estimated the cost implementing safety procedures and regulations in Kuwait to be 0.25-2% of total projects value. Everett and frank (1996), in Hassanein (2007).Re-examined the total costs of accidents and injuries to the construction industry. The total cost of accidents has risen to somewhere between 7.9% and 15% of the total costs of non-residential new construction (Hassanein 2007).

2.9 Safety Training

A study by Hinze and Gambatese (2003), in Hassanein (2007).concluded that specialty contractors' safety performance was consistently influenced in part by a number of factors. The factors show to improve safety performance include: minimizing worker turnover; implementing employee drug testing and training of workers Hassanein (2007). Huang and Fang (2003) believed that in the safety programs, for each projects of many contractors, it is a requirement that anyone working on site should receive at least eight hours of safety training or for refresher safety training.

Langford et al. (2000) identified the critical factors that influence the attitudes of construction workers towards safe behavior on construction sites. According to the results of their study, training of operative and safety supervisors is important to safety awareness and improved performance .The importance of safety training to improve the safety performance in the construction industry has been addressed by many researchers Huang et al. (2003) Aksonrn et al. (2008). Effective training of construction workers can be one of the best ways in improving site safety performance. Chinese construction industry had received limited education about safety issues Zeng et al. (2008). Similarly; in the study by Dingsdag et al. (2008) construction workers identified training as a necessary element of safety performance.

In Gaza Strip Hassouna (2005) found that 24% of the respondents were receiving training courses and all of them achieved a good benefit from it, the main course which was received included the first aid courses, causes of accidents, ways to prevent accidents, the safe technique of scaffolding, and using safety tools. It was also found that part of respondents received safety training abroad such as in Saudi Arabia and the United Arab Emirates (UAE) and other part received training courses in the Syndicate of engineering and in the contractor union. For organized safety training courses for managers, engineer, and labors Ahmed (2005) found 10% (8) of the respondents, from a total of 83 respondents, have training on how to use equipment and how to perform the danger activity safety, but the other respondents 90% (75) did not have any training for their workers, engineers and labors.

2.10 Accident Investigations

A subsequent study by Hinze and Raboud (1988), in Hassanein (2007). On large building construction projects in Canada has shown that larger firms generally had better safety records (Hassanein, 2007). The investigation of an accident can provide meaningful information that can be used effectively to reduce or even eliminate foreseeable hazards (Hinze and Wilson, 1996), in Hassouna (2005). Hinze and Wilson (1996), in Hassouna (2005). In their research found that in USA, the majority of respondents in their survey to record and investigate construction injuries agreed that accident investigations were vital to improved safety performance. In Hong Kong, accident reporting and investigation program was found to be most significant contributor to reducing site accident frequency rate (Poon, Ma and Ho, 2003), in Hassouna (2005). Respondents in Hong Kong also believed that reporting and investigating injury provides useful information to prevent similar accident in recurring. The information gathered from accident/incident investigation is also useful and effective mechanism to formulate the corrective actions (Poon Ma and Ho, 2003), in Hassouna (2005). In Kuwait, Kartam, et al. (2000), in Hassouna (2005). Found that most of contractors in Kuwait did not have a safety record.

2.11 Safety Meetings

A study by Hinze and Raboud (1988), in Hassanein (2007).concluded that lower injury rates were noted on projects that employed safety officer those which conducted job site safety inspections; and those which included safety in coordination meetings (Hassanein 2007). Tam et al. (2004), in Hassouna (2005). Believed that regular safety meeting are necessary for communicating safety information to all parties. 36% of the respondents in their study claimed that they had regular safety meeting, and the other indicated that safety issues were discussed and presented at other meetings, such as construction planning meetings. However, 87% of the respondents in Tam et al. (2004), in Hassouna (2005). Survey in China argued that the top management seldom attended the safety meetings.

2.12 Safety Regulations

In the studies of Kartam, in Kuwait (2000), in Hassouna (2005).And Hassouna (2005), in Gaza Strip respectively. Found out that there was a consensus between the respondents of their surveys that safety regulation is significant to reduce accidents in the construction site. The study of Tam, et al (2004), in Hassouna (2005). In China found that there was a consensus between the respondents of their surveys that safety regulation is significant to reduce accidents in the construction site.

In the study of Hassouna (2005), it was found that 75% respondents, from a total of (83) respondents had accidents in their construction projects during the last five years; 10% (5) of the respondents had death cases, while 14% (7) of them had injuries that caused permanent inability and more than 40% (20) of them had temporary injuries as the majority of contractors had a very high number of light injuries. This study also found that 92% (46) of consultants and 75% (15) of owners believed that safety is not confined only to those working in the field, but it extends to any party who could affect the safety performance in sites such as government. The majority of respondents agreed that workers have bad safety culture which contributes to increase accidents rates in construction, and the majority of participants agreed that consultants have the power and authority to force all employees in sites. On the role of designers, 49% (41) of the respondents agreed and 40% (33) of them strongly agreed that designers should be responsible for build ability and safe construction working and they have regular site visits to ensure safe construction as specified and record mistakes and notes which could be avoided in the next designs. Also, the majority of consultants and owners agreed to stop the contractors in preceding the work when they made safety violation. The majority of the respondents believed that the current regulations are inadequate. 37% (31) of the respondents believed that the current regulations were practical and could not be applicable in construction industry. On the role of insurance companies and ministry of labor, Ahmed found that the insurance companies care more than the ministry of labor in following safety issues in the construction sites. 30% (25) of the respondents agreed that the insurance companies arrange safety site visits and 14% (12) of them only agreed that the ministry of labor arrange such visits. The majority of respondents agreed that the implementation of total quality management in the construction industry can reduce accidents. For the contract made by

owners on safety conditions, the study found that 53% (44) of respondents believed that few owners institutions care more in safety conditions in its own contracts, such as UNDP and UNRWA, which include strong provisions and sometimes a penalties against contractors who made safety violation. On the penalties against contractors, 25% (21) of the respondents found that stopping the work when an injury or safety violation happened, were considered as a penalty because stopping the execution causes loss in the overhead, productivity and may delay the projects. On safety and using safety tools the study found that the majority of the respondents mentioned using hard hats with score (2.90) as the most important safety procedure, followed by having the first aid bag with score (2.85), emergency telephone number, and safety footwear are in the next degree (Hassouna ,2005).

2.13 Role of the Government towards safety

Kartam et al. (2000), in Hassouna (2005).Found that all the respondents for their survey agreed that Kuwait government should play an important role in safety management in the construction industry. In Kuwait, every contractor is required to contact the safety department of the Kuwait municipality when starting new projects and submit necessary documents such as building permit, area location. The safety department provides safety information regarding the proposed job or activity, and a safety representative conducts a site visit to ensure safe places for storage, temporary site offices, and services. Safety posters with major instructions are given to the contractor to be hung at the job site, in addition to safety interaction procedures and accident prevention methods for each activity related to the proposed job. The municipality charges a certain fee as insurance for safety and work completion. This amount is returned to the contractor at the completion date of the project along with a clearance certificate (Kartam, et al, 2000), in Hassouna (2005).

The situation in Saudi Arabia seemed worse than in Kuwait because the practice of safety in Saudi Arabia is not regulated by any government agency Jannadi et.al (1998). The practice of safety in construction in the USA is regulated by governmental agencies such as the occupational safety and health administration (OSHA), which provides strict rules and regulations to enforce safety and health standards on job sites.

2.14 Insurance Companies towards Safety

Insurance companies play an important role in the improvement of health and safety standards. Since 1969, it has been a legal requirement for employers to insure against liability for injury or disease to their employees arising out of their employment. This is called employers' liability insurance. Certain public sector organizations are exempted from this requirement because any compensation is paid from public funds. Other forms of insurance include fire insurance and public liability insurance (to protect members of the public). Premiums for all these types of insurance are related to levels of risk which is related to standards of health and safety. In recent years, there has been a considerable increase in the number and size of compensation claims and this has placed further pressure on insurance companies. Insurance companies are becoming effective health and safety regulators by weighing the premium offered to an organization according to its safety and/or fire precaution record (Phi Hughes et.al 2001).

2.15 Advantages of Applying Safety on construction sites.

Applying safety on the construction projects has many advantages, as summarized below:

- Reduce the accidents on the construction sites.
- Help end projects in the early time.
- Increase employee morals
- Increased productivity.
- Decreased the number of compensation.

CHAPTER III
METHODOLOGY

This chapter discusses the methodology which is used in this research. The methodology in this research included research method, flow chart, respondent's questionnaire design, data analysis, and the method of processing and analyzing the data, questionnaire content.

3.1 Research Method

Both two types of research method are used they are, the qualitative and quantitative approaches are used in this research, and compare the results in this research with other research to access to the fact. Both two type of research method are used for to realize the real safety problems and danger of injuries that occur in the Tripoli city, to investigate safety procedures, regulations, policies, and accident prevention methods related to the construction projects in the Tripoli city, to provide methods and suggestions to improve the safety performance in construction projects in the Tripoli city.

3.2 Flow Chart

Methodology flow chart (see figure 3.1) which included key word for the end step, started with objectives, and literature review with key word modification the questionnaire to suit the construction projects in Tripoli city, and conducting design on the three part of the respondents, namely: Owners, consultants, contractors, also questionnaire design depend on the natural of work and issues safety in the construction projects in Tripoli city, also data analysis there are three type of analysis in this research included: Microsoft excel, and score ,and a few questions analysis separately, finally conclusion and recommendation.

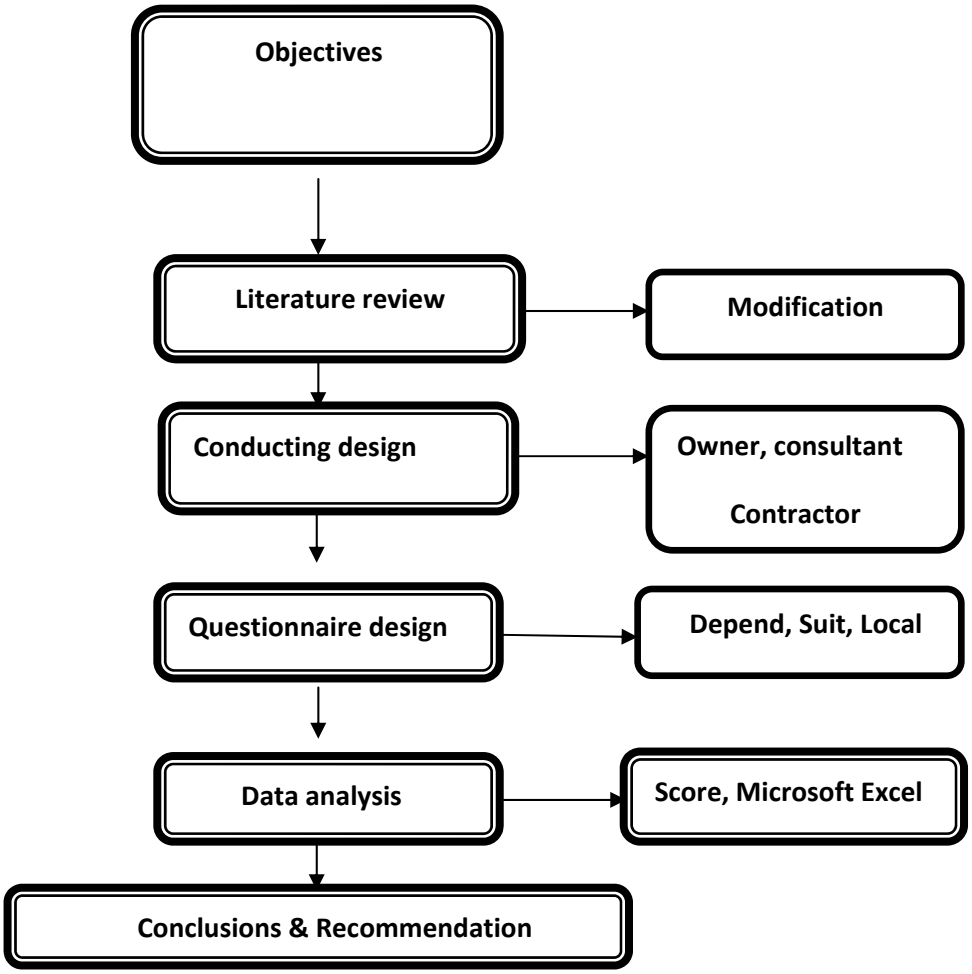

Figure 3.1 Methodology flow Chart

3.3 Respondents

Three types of respondents are considered in this study. The first respondents is the contractors in the Tripoli city they executed so many projects during the last five years. The second type of respondents is consultants and executed so many construction projects during the last five years. The third type of respondents is owners the samples are selected randomly from each type of construction professionals' contractors, consultants and owners, also the experience of the respondents more than ten years, and number of projects executed in the last five years more than thirty projects with the different of size of those projects.

3.4 Questionnaire Design

Questionnaire is used to collect the data. The designed questionnaire mainly depended on the questionnaire of Ahmed (2005). Modifications and new questions are then added to suit the local construction industry in Tripoli.

3.5 Data Analysis

To the quantitative and qualitative analysis in this study use Microsoft Excel spreadsheet computer program for most of the questions in Part (B) which is to realize the real safety problems and danger of injuries that occur in Tripoli. And (D) to provide methods and suggestions to improve the safety performance in construction projects in the Tripoli city. A few open questions in part (B) and (D), however, analyzed separately. Score used to analyze part(C) which is investigate safety procedures, regulations, policies and accident prevention method related to the construction industry in the Tripoli city, and part of question (D) table where in this part Likert Scale questions are used. The main principle used in the analysis is the score and the percentage weight to obtain the perfect solution for the respondents. In the part (D) one question use Ranking is followed by comparison of score values for all the three parties of the respondents.

3.6 Questionnaire Content

The questionnaire included three types of questions. These types are:

- Open-close questions, which are use in questions number 13, 15, 18, 19, 20, 21, 23, 24, 26, and 28 (See appendix I).
- Likert scale questions, which are used in part (C) of the questionnaire and a few question in part (D).
- Rating scale questions, which are used in question number 25 in part (D) of the questionnaire.

The aim of the questionnaire used in this study is to realize the real safety problems and danger of injuries that occur in construction projects in the Tripoli city, and to investigate safety procedures, regulations, policies, and accident prevention methods related to the construction projects in the Tripoli city there; and to provide methods and suggestion to improve the safety performance in construction projects in the Tripoli city.

CHPTER IV

RESULTS

This chapter presentation the survey results of the four parts. (A) Firstly Response among the officials the second Part (B) of the objectives to realize the real safety problems and danger that occur in Tripoli city. The third part (C) to investigate safety procedures, regulations, policies, and accident prevention methods related to the construction projects in Tripoli city. The fourth part (D) to provide methods and suggestions to improve the safety performance in construction projects in Tripoli city.

4.1 Part A : Response among the officials

Participated in the questionnaire are three types of the respondents in the Tripoli city Owners, contractors, and consultants. 40 questionnaires have been distributed and the response rate is 75%. 33 %(10) of the owners, and the 33 %(10) of contractors, and the 33 %(10) of the consultants show (figure 4.1) response rate among respondents. All the Type of the respondents executed many projects at the last five years.

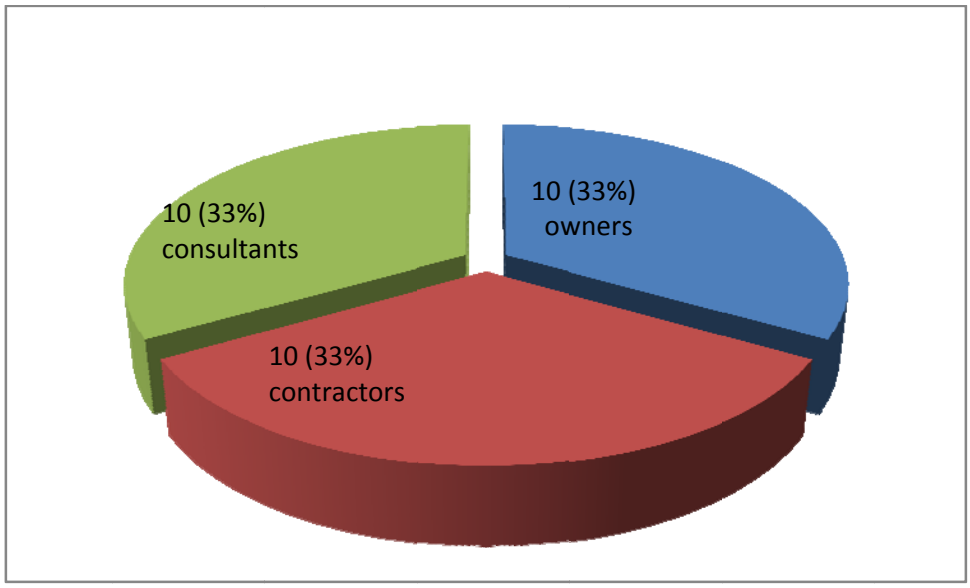

Figure 4.1: Response rate among the officials

4.2 Part B: Safety problems and Danger in the Tripoli city

4.2.1 Accidents during the last five years

The results presentation the serious bad situation where 21(70%) of the participants in the survey had accidents in their construction projects during the last five years (Figure 4.2) Accidents occurred in 80% (8) of contractors' construction sites, 60 %(6) of the responding consultants, and 70% (7) of the responding owners stated that accidents occurred during working with projects were supervised or owned by them.

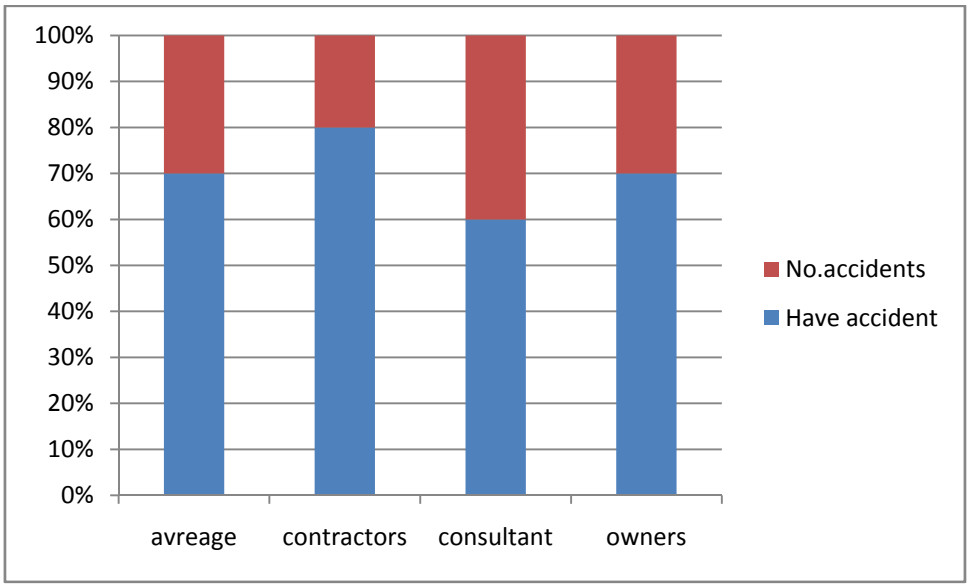

Figure 4.2: Accident rates in construction projects among the three parties

4.2.2 The degree of the injury

Types of injuries among the respondent during the last five years that 40% (4) of the contractors had death cases, 40% (4) of them had injuries that caused permanent inability, and 60% (6) of them had partially inability, and 80% (8) of them had light injury, and 8% (8) of them had other injuries it is also during the last five years that 10% (1) of the consultants had death cases, 30% (3) of them had injuries that cased permanent inability, and 20% (2) of them had partially inability , and 50% (5) of them had light injury, and 50% (5) of them had other injuries. It is also during the last five years that 10% (1) of the owners had death cases, 20% (2) of them had injuries that cased permanent inability, 10% (1) of them had partially inability, and 50% (5) of them had light injuries, and 30% (3) of them had other injuries.

The Total injures among the respondents are 20 % (6) cases death, 30%(9) cases permanent inability, also 30%(9) cases partially inability, and 50% (15) cases other injures, and 56% (17) cases light injuries, show figure (4.3).

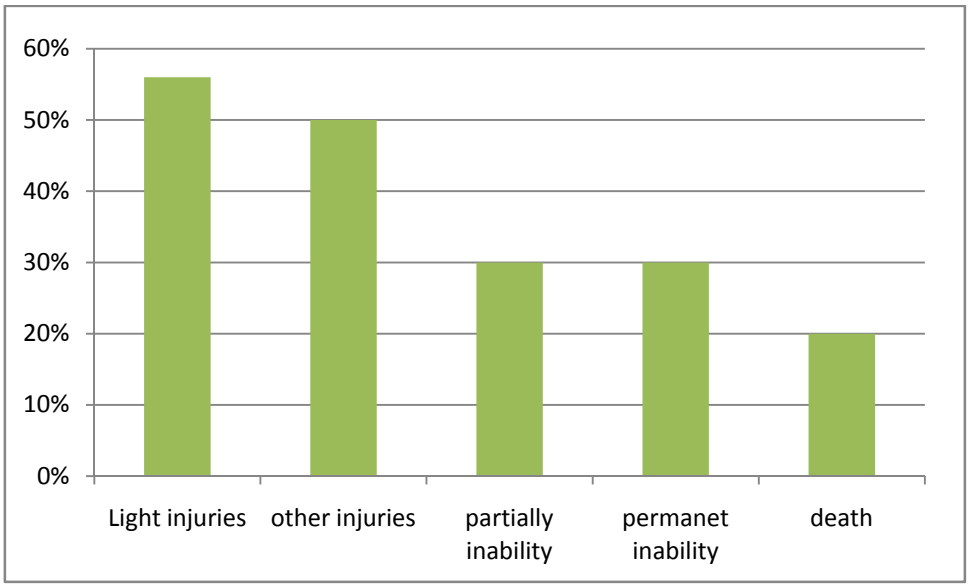

Figure: 4.3: Type of injuries among the respondents

Definitions:

Partial inability is the loss of part of the body can recover from it. Permanent inability is the loss of part of the body also cannot be cured from it. Light injury, is some kind of injury, put can recover from it. Other injury is some kind of injury happened during the work in the construction site. Death, is losing of life and spill over the family and community.

4.2.3 Recording Accidents

Figure (4.4) show respondents who record accidents 100 %(30) all the respondents (Contractors, consultants, owners.) in the Tripoli city did not keep records of The Size, nature, Cause, and results of the injury just the real injuries.

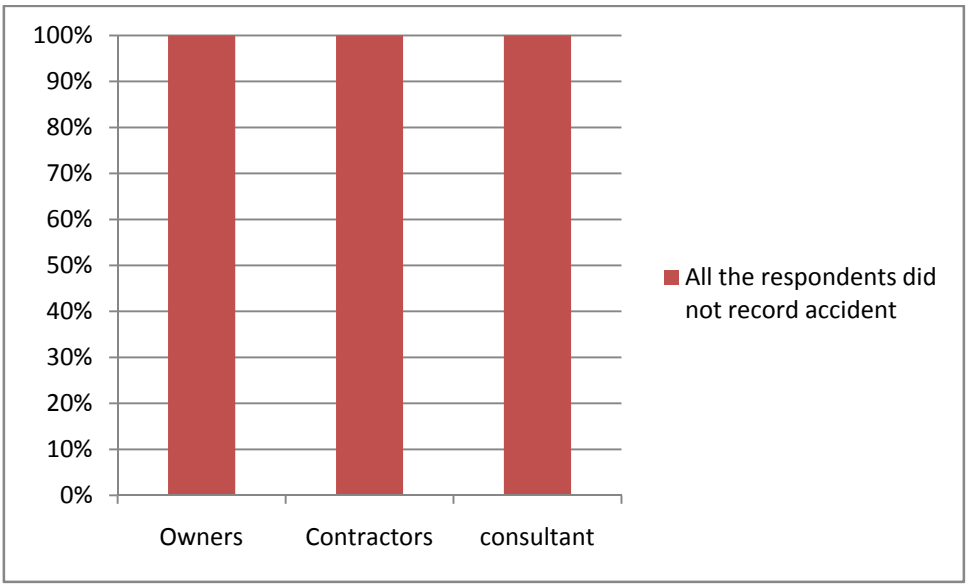

Figure 4.4: Respondents who did not record accidents

4.2.4 Accidents Rates on Construction Site

A high percentage of the respondents believed that the high accidents rates on construction site were due to the first management carelessness, and lack of legislation and careless of the consulting, and all the reasons (the percentage were 56% (17) and 50% (15) and 50 % (15) and 50% (15), respectively) (figure 4.5).Besides, they considered that careless attitude of workers and lack of safety knowledge (26 % (8) and 23% (7), respectively).

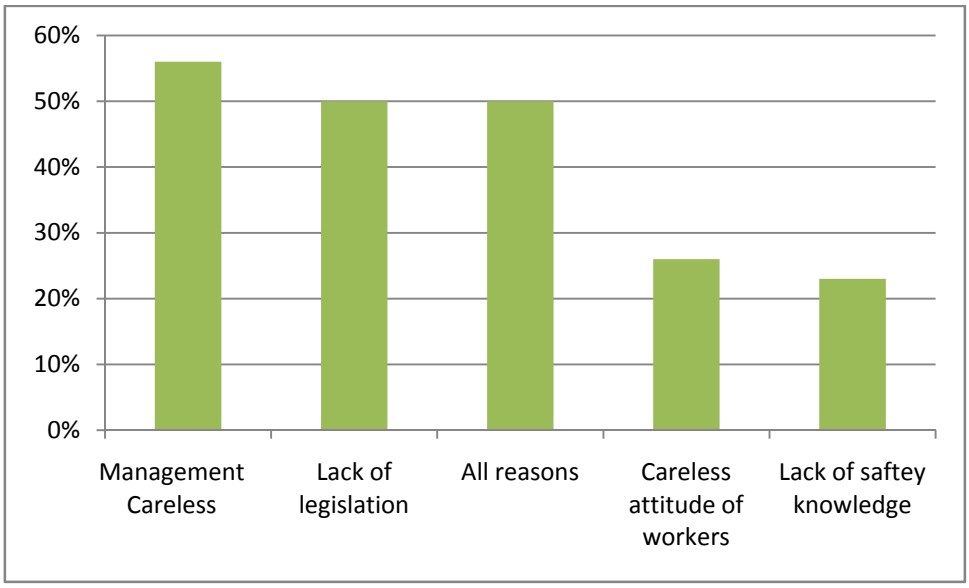

Figure 4.5: Reasons of the high accident rates in construction projects

4.2.5 The Major Reasons of Accident on Site: The Management Perspective

The respondents of survey believed that top management level of all the construction firms in the Tripoli city participates in increasing accidents rates due to lack employs of safety officer with the percentage (56% (17)) .In addition, the cost of safety (50% (15)) , and also the respondents believed that other factors have a direct effect in increasing the accidents rates (46% (14)) and also the respondents believed that , lack of safety motivation (13 (43%)) , and the top management neglect safety training with the percentage (33% (10)) and the finally the lack of safety policy (33% (10)) show figure (4.6).

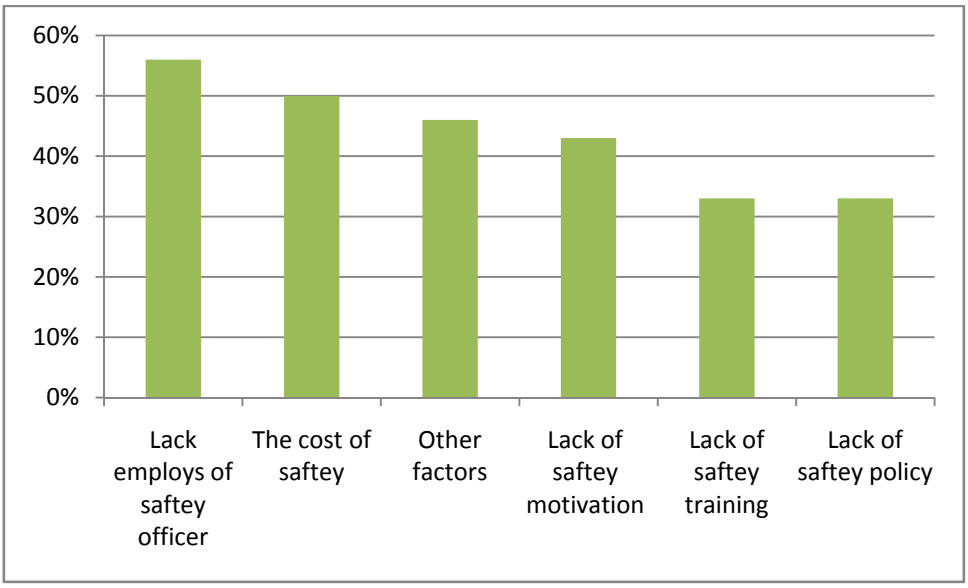

Figure 4.6: The shortage of management

4.2.6 The Major Reasons of Accidents on Site: The Workers Perspective

19 (63%) of the respondents believed that the lack of safety culture is the most important reasons in causing accidents (Figure4.7). The lack of training and lack of experience in using equipment are the next two reasons of causing accidents among the construction workers (the percentage 60% (18) and 53% (16), respectively). The lack of motivation is lesser reason that other ((10 (33%)).and the other 8(26%) or all that mentioned are serious reasons that increase the rate of injuries between workers.

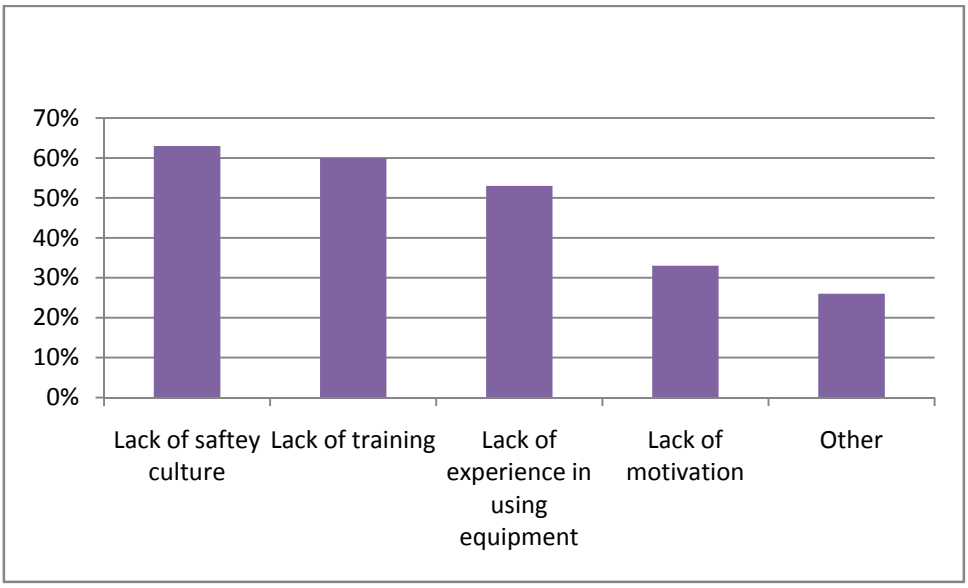

Figure 4.7: The role of workers

4.2.7 Safety Responsibility

Figure (4.8) shows that 93% (28) of the respondents (contractors, consultants, and owners) agreed that (contractors) are responsible for the safety performance in construction site, and the other of respondents result arranges the safety responsibility as follows: all reasons with the 80% (24) percent, consultants with 73% (22) and Government with the (19) 63% and workers with 53% (16) and owners were the least responsible with 7 (23%) only of votes. I n table (4.1), 90% (9) of the contractors blamed the all parts should be responsible to apply safety performance in the construction projects. Also contractors blamed themselves with (10) 100% to the responsible to apply safety performance in the construction projects. Government and consultants the next indicted form the perspectives of contractors, workers and owners (see table 4.1).On the other hand, consultants put the all parts with the 100% (10) (Government, workers, consultants, contractors and owners) should be responsible for applying safely on the construction industry. And also the consultants blamed the Government to the responsible on the construction industry with 100 %(10), and the workers with (9) 90% on the construction industry, and contractors and consultants and owners, respectively).while the owners assumed that safety is the responsibility of both contractors with (10) 100% and

consultants with degree ((8) 80%). Table 4.1 demonstrates opinions of each party about who is the responsible about construction safety in the Tripoli city.

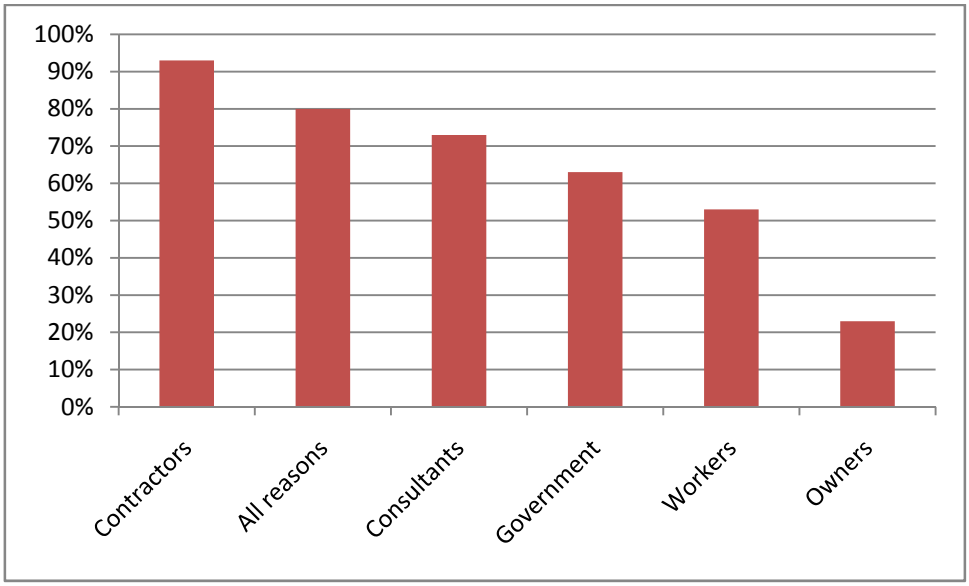

Figure: 4.8: Construction safety responsibility

Table 4.1 Opinion of contractors, consultants and owners about who is the responsible in applying the safety in the construction site.

Contractors opinion		**Consultants opinion**		**Owners opinion**	
Contractors	100%(10)	Contractors	80% (8)	Contractors	100% (10)
Consultants	80% (8)	Consultants	60% (6)	Consultants	80% (8)
Owners	50% (5)	Owners	10% (1)	Owners	1(10%)
Government	80% (8)	Government	100% (10)	Government	10% (1)
Workers	50% (5)	Workers	90% (9)	Workers	20% (2)
All(reasons)	90% (9)	All (reasons)	100% (10)	All(reasons)	50% (5)

4.2.8 The Role of Governmental Institutions in Improving Construction Safety

100 % (30) all the respondents agreed that there is on governmental institution that follow up safety in construction, enlightenment of the construction employs, in applying safety legislation, or help in improving safety performance in construction sites in the Tripoli city.

4.2.9 The Costs of the Construction Safety

Figure (4.9) shows that (43 %) 13of respondents (contractors, consultants, and owners) believed that the cost of the construction safety less than 0.5%.Anther 5(16%) estimate the cost 1-<2% and another 4(13%) estimate the cost approximately 0.5<1% and also 4(13%) estimate the cost of safety approximately2-<3% and a few the respondents approximately 4(13%) estimate the cost of safety more than 3%.

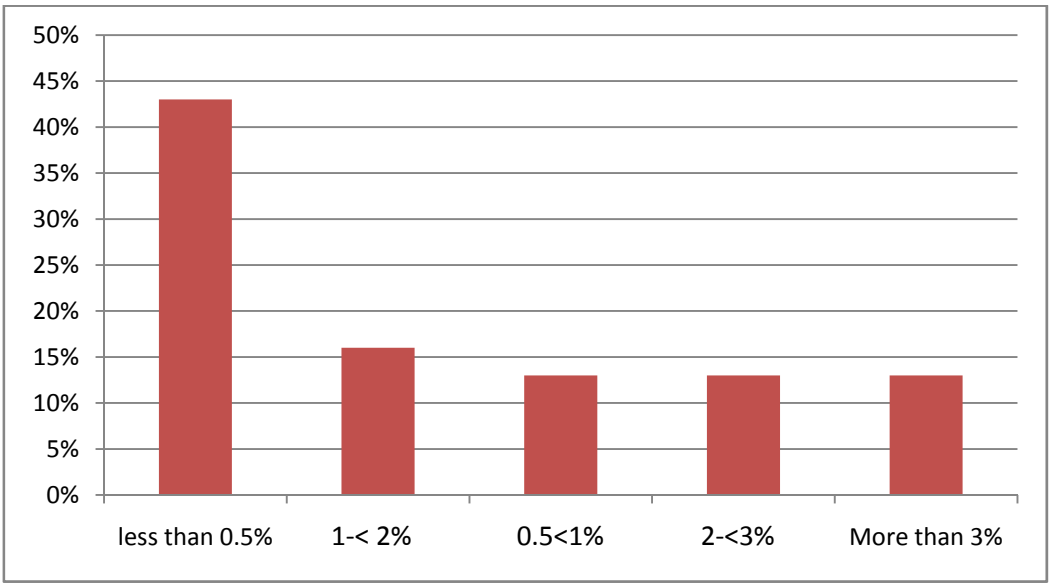

Figure: 4.9: The cost of the construction safety

4.2.10 The Clearest Potential Hazards in the Sites

The respondents were asked to give information about the clearest potential hazards summarized following:

- Piles of iron on the site.
- Stones within the site.
- Nails on the panels at the construction sites.
- Workers not wearing safety equipment on a construction site.
- The lack of safe corridors trucks and vans.
- There is no organizing of materials on a construction site such as cement, sand, iron which would lead to accident on construction sites.

4.3 Part C: To Investigate Safety Procedures, Regulations, Policies, and Accident Prevention Methods Related to the Construction Projects in Tripoli City

In this part there is 17 questions with a three-point Likert scales (disagree (**DA**), and neutral **(N)**, and Agree (**A**)).The purpose to investigation safety procedures, regulations, policies, and accident prevention methods related to the construction projects in the Tripoli city (See appendix **I**). For calculated the score, and the percentage weight (See appendix **II**). In the analysis, these questions grouped into (4) main groups: safety improvement, construction safety responsibly, the role of the government institutions and the insurance companies, and safety-total quality management relationship.

4.3.1 Safety Improvement

Table 4.2 shows that the score for three questions mentioned in the table are more than 2.8. These results mean that there was a consensus among the respondents from the three groups of the respondents implementation of safety regulation helps in reducing accidents, and they also agreed that all construction professionals should play more active roles in sustaining constriction safety, and also constriction professionals should play more active for construction workers. (Questions part C 1, 10, 14).

Table 4.2 Safety improvement (Question Part C 1; 10; 14)

Question Part C No.	The Need to Improve Safety	Respondents	A	N	DA	score	PW
1	Implementation of Safety regulation helps in reducing Accidents.	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%
10	Construction professionals should play more active roles in sustaining Construction safety.	Contractors	100% (10)			3	100%
		Consultants	90% (9)		10% (1)	2,8	93%
		Owners	100% (10)			3	100%
14	Construction professionals should play more active roles in improving Safety culture for construction workers.	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (Score 2.8 or more 3 agreed, score 1 disagreed)
Source: data processed, 2011

4.3.2 Construction Safety Responsibility

According to the result of the question if construction safety responsibility confined only to those working in this field or not, from question part C (no.2) the score for the three parties approaches to (1) (disagree-DA).100% (10) of contractors (10 DA),100%(10) of consultants (10 DA) and 100% (10) of owners (10 DA) believed that safety is not confined only to those working in the field, but the extends to any party who could affect the safety performance in sites such as government or insurance companies.

Table 4.3: Construction Safety Is Only Confined To Construction Work On Site.

Question Part C No.	Safety Responsibility	Respondents	A	N	DA	Score	PW
2	Responsibility for safety and health is only confined to Construction work on site.	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (Score (2.8) or more agreed, score (1) disagreed)
Source: data processed, 2011

Question part C (no.3) (Table 4.4) was asking the respondents about the responsibility of workers. The score for the three parties were (3), which means that the all the respondents. Agreed that workers have bad safety culture which contributes to increase accident rates in constructions sites.

Table 4.4: Safety Culture for Construction Workers

Question Part C No.	The Need to Improve Safety	Respondents	A	N	DA	Score	PW
3	The main cause of accidents on site is that the workers are lacking of Safety knowledge.	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A : Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (score 2.8 or more 3 agreed, score1 disagreed)
Source: data processed, 2011

Question part C (no.3) (Table 4.5) asks the respondents about the responsibility of supervision /consultants. The majority of participants agreed that consultants have the power

and the authority to force all employees in sites to comply with safety provisions .They also should participate in improving contract conditions by making them stricter.

The results in Table (4.5) show that all contractors blamed consultants for the shortage in applying and enforcing the safety in construction and the score were(2.9).The score for consultant were approximately(3) and owners were approximately(3) which mean owners strongly blamed consultants about the consultants carry both amoral and responsibility with 100% (10) and the consultants agree with 100% (10) and the contractors with (90%) agree that consultants carry both a moral responsibility and a duty of care for building/demolition workers and public in General. see (Table 4.5).

Table 4.5: Consultant's responsibility towards construction safety.

Question Part C No.	The Need to Improve Safety	Respondents	A	N	DA	Score	PW
4	consultants carry both a moral responsibility and a duty of care for building/demolition workers and public in General.	Contractors	90% (9)	10% (1)		2.9	97%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (score 2.8 or more agreed, score (1) disagreed)
Source: data processed, 2011

Table (4.6) show that all 100% (30) of the respondents agreed that designers should be responsible for build ability and safe construction working and they should have regular site visits to ensure safe construction as specified and record mistakes and notes which could be avoided in the next designs (Question part C No.11).

Table 4.6: Designers Responsibility towards Safety

Question Part C No.	Designer Responsibility	Respondents	A	N	DA	Score	PW
11	Design engineer should be responsible for build ability and safe construction working and they should have regular site visits to ensure safe construction as Specified.	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (score 2.8 or more 3, agreed, score 1 disagreed)
Source: data processed, 2011

Question part C No.12 asked if owner's institutions should include subject of safety in the bid entry. Table (4.7) shows the results and the percentages of the respondents. All respondents agreed that owners should include subject of safety in bid entry and in bid awarding.

Table 4.7: Owner's Role towards Safety

Question Part C No.	Owner Responsibility	Respondents	A	N	DA	Score	PW
12	Owner's institution should include subject of safety in the bid entry	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight)(Score 2.8 or more 3 agreed, score 1 disagreed)

In the case of accidents, the respondents were asked in Question part (C No.15) if contractors have the whole responsibility towards safety in the construction sites. (Table 4.8) shows that the score for contractors was (1) or disagrees. The table shows that 100% (10) of contractors disagreed to hold the contractor the responsible for construction safety.

Table 4.8 Contractor's Responsibility toward Construction Safety

Question Part C No.	Contractor's Responsibility	Respondents	A	N	DA	Score	PW
15	Contractor is responsible in the case of accident	Contractors			100% (10)	1	33%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A : Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (score 2.8 more 3 agreed, score 1 disagreed)
Source: data processed, 2011

(Table 4.8) also shows that all (consultants and owners) agreed that contactors are the only responsible for construction safety where the score for them approached to (3). The majority (8) 80% consultants and (10) 100% owners agreed to stop the contractor in preceding the work when he made safety violations (Table 4.9). This may be assumed as a punishment for contractos.While 100% (10) of contractors ((1)10% N plus (9) 90% DA) disagree stop the contractors when making safety violations.

Table 4.9: Stopping Contractors to Proceed In Working

Question Part C No.	Contractor responsibility	Respondents	A	N	DA	score	PW
16	The contractor should be stopped when making Safety violations.	Contractors		10% (1)	90% (9)	1.1	37%
		Consultants	80% (8)	20% (2)		2.8	93%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight)(score 2.8 or more 3 agreed, score 1 disagreed)
Source: data processed, 2011

4.3.3 The role of the Government institutions and insurance companies towards safety

There was a consensus among the respondents that special governmental institutions should increase their effort and participate in improving construction safety by organizing safety-training course for workers, foremen, supervisors, and follow up the construction projects, engineer. They should enact safety regulations; arrange sudden site visits and punish those who make safety violations; and enlighten them by safety bulletins (Table 4.10). (10) 100% of owners and (10) 100% of consultants agreed to think that safety should be followed continuously, and governmental institutions could apply that.

However (3) 30% of contractor believed that the government could not apply their effort and participate in improving construction safety due to the size and the huge numbers of construction projects and the need to large numbers of government employees to cover that.

Table 4.10: The Role of Governmental Institutions towards Construction Safety

Question Part C No.	Government role	Respondents	A	N	DA	score	PW
13	Special governmental institutions should increase their effort in the field of Construction safety.	Contractors	70% (7)		30% (3)	2.4	80%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight)(score 2.8 or more 3 agreed, score 1 disagreed)
Source: data processed, 2011

As to the question on the degree of knowledge on the current safety regulations, the score for the three parties approaches to (1) (Question part Cno.5 -Table 4.11) which means disagree do not have a good knowledge of the current regulations regarding construction site. The results question part C on.6 shows in (Table 4.11) that all the respondents disagreed that Ministry of Labor gives information about the current safety regulation .In (Table 4.11), the results of question part C no .7 show that the score for each party is also (1), which means that the majority of the respondents believed that the current regulations are inadequate .100%(30) of respondents ((10) 100%,(10) 100%,(10) 100%).

Table 4.11: Construction safety regulations

Question Part C No.	Government Role	Respondents	A	N	DA	score	PW
5	You have a good knowledge of the current regulations Regarding construction site.	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%
6	The ministry of labor gives adequate information about the current safety regulations For contractors.	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%
7	The current regulations are adequate and applicable to the local construction sites in Tripoli city.	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight)(Mean 2.8 or more 3 agreed, mean 1 disagreed)
Source: data processed, 2011

Questions part (C 8) and(C 9) in Table (4.12) ask if delegated persons from the ministry of labor or from the insurance companies arrange sudden visits to construction sites. The results listed in Table (4.12) show that both the ministry of labor and insurance companies are less care in following safety issues in the construction sites.

Table 4.12: Ministry of labor and the insurance company visit the site

Question Part C No.	Government & Insurance Role	Respondents	A	N	DA	score	PW
8	A delegate from the Ministry of Labor visit the construction sites to follow up safety performance	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%
9	Insurance companies visit the sites for the insured Projects.	Contractors			100% (10)	1	33%
		Consultants			100% (10)	1	33%
		Owners			100% (10)	1	33%

(A: Agree; N: Neutral; DA: Disagree; PW: Percent Weight)(Score 2.8 or more 3 agreed, score 1 disagreed)
Source: data processed, 2011

4.3.4 Safety and Total Quality Management

In table (4.13) Questions Part (C 17), all of the respondents from (contractors, consultants and owners) agreed with score (3) that the implementation of total quality management in construction projects could reduce accidents.

Table 4.13: Safety and Total quality management

Question Part C No.	Total Quality Management	Respondents	A	N	DA	score	PW
17	Implementation of Total Quality Management in the construction industry can Reduce accidents.	Contractors	100% (10)			3	100%
		Consultants	100% (10)			3	100%
		Owners	100% (10)			3	100%

(A : Agree; N: Neutral; DA: Disagree; PW: Percent Weight) (Score 2.8 or more 3 agreed, score 1 disagreed)
Source: data processed, 2011

4.4 Part D: To Provide Methods and Suggestions to Improve the Safety Performance in the Construction Projects in the Tripoli City.

4.4.1 Reporting Accidents and Safety Violations

Figure (4.10) shows who recording accidents and safety violations, the results in the Libya (especially in the Tripoli city) (30) 100% all the respondents did not care about reporting accidents, hazards, or violations.

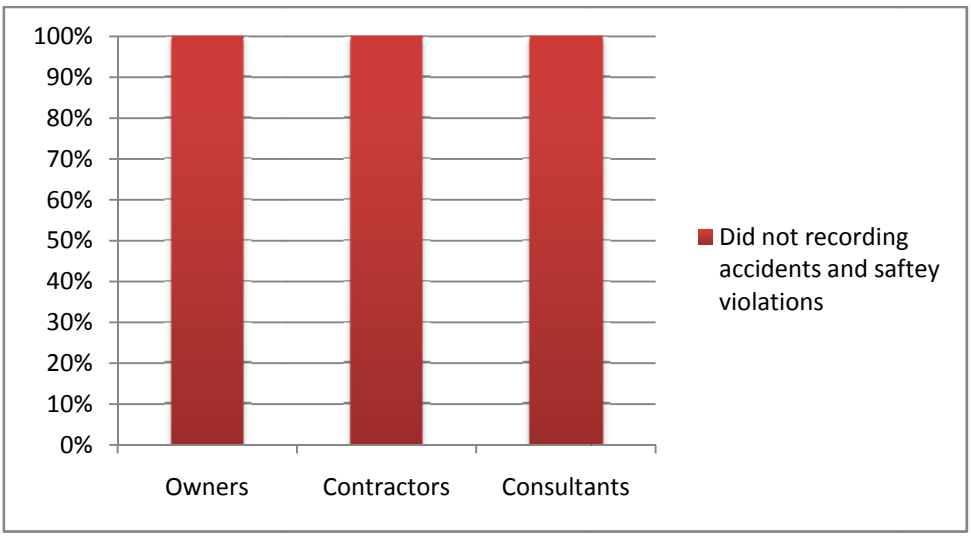

Figure 4.10: Respondents who did not recording accidents and safety violations

4.4.2 Contracts/Owners-Safety Conditions Relationship

All the respondents (30) 100% agreed there is no relationship between the contract and owners and safety conditions, such as penalties against contractors ,also consultants ,when they made the safety violation during the construction projects, also stopped the contractors when they made safety violation.

4.4.3 Penalties Against Contractors

All the respondents (30) 100% in the Tripoli city agreed there is no a strict measure against the contractors who makes a safety violation in the construction site, due to there is lack of commitment from the construction professionals and the government about the issues of safety in the construction sites.

4.4.4 Safety Training

Figure (4.11) show that All the respondents (30) 100% of the (Contractors, consultants, and owners) did not received any safety-training course.

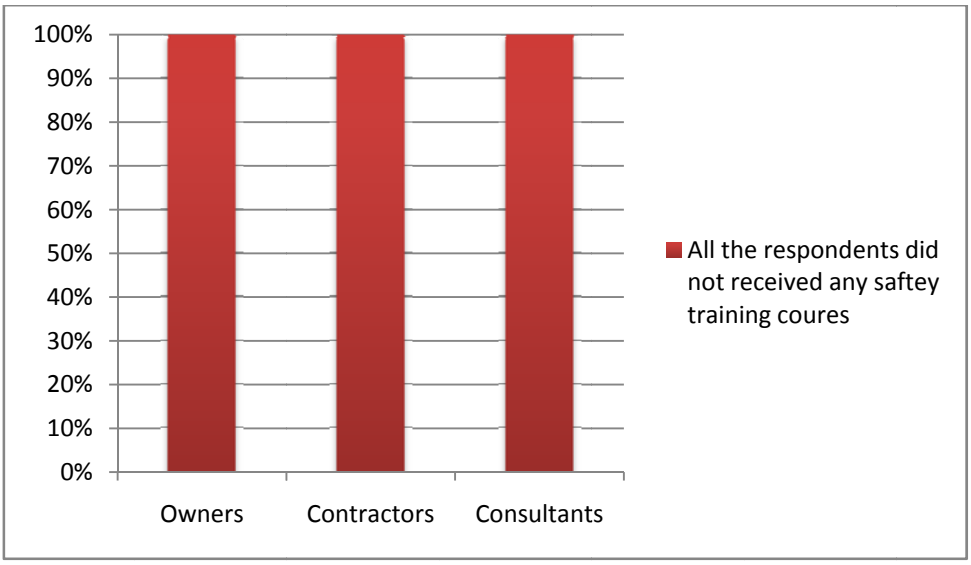

Figure 4.11: Respondents who did not received safety-training courses

4.4.5 Organized Safety-Training Courses for Managers, Engineers, Labors

All the respondents (30) 100% did not have safety training courses for their managers, engineers, supervisors or workers in their firms,dut to there lack of commitment from the construction professionals ,also there is lack form the government to provide the safety courses for managers,engineers,labors.

4.4.6 Training Workers for Improving Construction Safety

All the respondents (30) 100% agreed that training workers are necessary to improve construction safety, due to the tanning have many benefit such as decrease the numbers of accidents, also decrease the compensation, and increase the moral of the labor in the construction sites.

4.4.7 Chance to Receive a Safety-Training Course

The respondents asked if safety training course is allowed to you, what the subjects you desire to receive all the respondents (30) 100% said the First aid courses, hazards identification ,safety reporting fall protections, fire protection ,equipment safety, and other safety concerns are the main topics they were mentioned. There is an imminent need to enhance safety training for the practicing engineers and the potential engineers in the universities. There is also an imminent need to organize safety-training courses by governmental institutions. The respondents believed in the benefits of the safety training program.

4.4.8 Conducting Safety Inspections

Figure (4.13) show there is no safety inspections, all the respondents' (30) 100 % Contractors, consultants, and owners agreed there are no conduct special safety inspections in the construction sites.

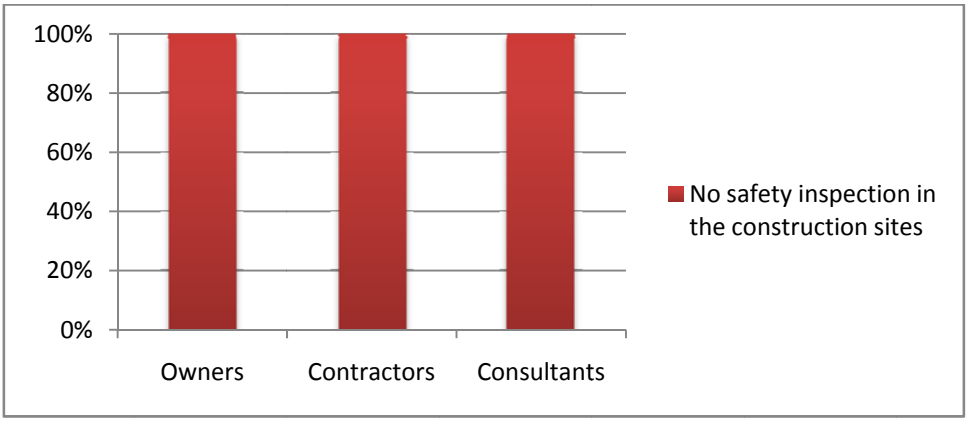

Figure 4.12: There is no safety inspection in the construction sites

4.4.9 Safety Tools

(Table 4.14) illustrates the results and the average percentage of the participated firms (Contractors, consultants, and owners) in the Tripoli city that concern about using of safety and emergency tools in construction sites. When ranking the listed seven tools, the result found that the concern in using first aid came in the first degree. Hard hats bags, and safety footwear, are in the next degree of concern respectively, and then the use of fire protection, eye protections, emergency telephone numbers, and other emergency tools had less concern from the previous tools. The use of first aid bag hard hats because the price of this tools better than the other tools.

Table 4.14 Using Safety Tools in Construction Sites

No	Safety tools	Always	Sometimes	Rarely	No	Score	Ranking
1	First Aid Bag	100% (30)	-	-	-.	4	1
2	Emergency Telephone Number	-	3.33% (1)	60% (18)	36.66% (11)	1.67	6
3	Eye Protection	-	20% (6)	33.33% (10)	46.66% (14)	1.73	5
4	Hard Hats	80% (24)	20% (6)	-.	-	3.80	2
5	Safety Footwear	70% (21)	23.33% (7)	3.33% (1)	3.33% (1)	3.60	3
6	Fire Protection	3.33% (1)	13.33% (4)	50% (15)	33.33 (10)	1.87	4
7	Other Emergency Tool	-.	3.33% (1)	30% (9)	66.66% (20)	1.37	7

(-: not available)
Source: data processed, 2011

4.4.10 Safety Policy

The respondents asked if there is clear safety policy in their construction projects all the respondents (30) 100% did not have a written policy in their firms or their construction projects, due to all the respondents they do not have knowledge about the ways to improving the safety performance in the construction sites.

4.4.11 Safety Meetings

Figure 4.12 show who did safety meeting in the construction site .The respondents asked if there is safety meeting during their construction projects, all the responding agreed (30) 100% there is no safety meeting during the construction sites.

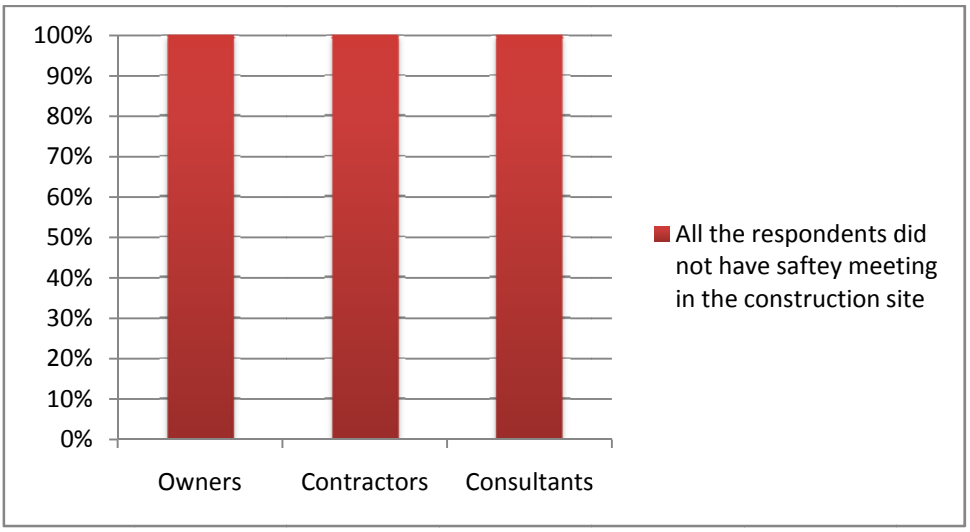

Figure 4.13: Safety meeting in the construction sites

4.4.12 Suggestions from the Respondents

Regarding officials, the government should follow the safety performance in the construction sector and the implementation of programs for improvement of safety performance also should be the role of contractors, and owners, and consultant more efficient to the improvement safety performance ,also provide training to workers and to provide programs to help workers to educate and raise the culture among the workers, also the insurance company must visit construction site to have insured, and government must follow all special programs the development of safety performance on construction site.

CHAPTER V

DISCUSSION

5.1 Part B: Discussion Safety Problems and Danger in the Tripoli city

5.1.1 Accidents during the Last Five Years

The results highlighted the serious bad situation where 21(70%) of the participants in the survey had accidents in their construction projects during the last five years. Accidents occurred in 80% (8) of contractors' construction site.60 % (6) of the respondents consultants and 70 % (7) of the responding owners stated that accidents occurred during working with projects were supervised or owned by them (see figure 4.2), In general, the result in Tripoli city) very high accidents, due to the respondents during the last five years executed so many projects with the different size and the different nature of the projects during the last five years. That is why the number of the accidents it's so high with the respondents to other respondents, it is also the results in Tripoli city seem convergent and very high when compared with other countries. A study of Hassouna (2005) in Gaza strip which found out 75% (62) among the (83) respondents had accidents in their construction projects during the five years.

5.1.2 The Degree of the Injures

The type of the injures among the respondents the last five years it's so high, due to the numbers of executed the projects is high, and the natural of works without any legislation form the respondents, and the government to cover that, and also to care about the workers in the construction sites. The injures among the respondents, 20% (6) of the them had death cases, 30% (9) of them had injuries that caused permanent inability, and 30% (9) of them had partially inability, and 56% (17) of them had light injury, and 50% (15) of them had other injuries.(see type of injuries among the respondents Figure; 4.3).But in general the Tripoli city, there were difficulties in obtaining records from the respondents to understand the rates and the causes of fatalities and injuries. These difficulties were due to the lack of records kept

by respondents and the entire respondents do not recording the accidents just the real injuries, due to the lack of reporting accidents.However,in some cases, when the records were available, there was difficulty in finding or obtaining them .The results in Tripoli city is very high when compare with the other countries, a study of Hassouna (2005) in Gaza strip which found out 10% (5) of the respondents had death cases, and 14% (7) of them had injuries that caused permanent inability and more than 40% (20) of them had temporary injuries and the majority of contractors had a very high number of light injuries. But in general in the Tripoli city. The main reasons of fatality cases were falling from heights, or being caught under excavations, or bad use of equipment, or dropped objects. Also the results in Tripoli city agreed with the study of Zeng et al.(2008), it has been pointed out that some Accidents such as falling from height and hit by falling materials, and with the results of Alazeb (2004) in Egypt ,in Hassouna (2005). which found out the main fatality cases were falling from heights, or being caught under excavations.

5.1.3 Recording Accidents

In Tripoli city all the respondents100 % (30) of all the respondents do not keep records of the Size, nature, Cause, and results of the injury just the real injuries (See figure 4.4) .That main problems of the respondents in the construction projects in Tripoli. This problems can be interpreted to three reasons; the first all the respondents do not have knowledge about the method that can improving the safety performance in the construction projects, the second reason, the safety is not priority of them, the third the number of accidents it so high that is why they did not have the recording accidents. The results in this study the similar with the study of Godwin (2011), in Nigerian which found out accidents and injuries are not reported and clients, consultants and contractors give little or no attention OHS. Also similar with the results Kartam, etal. (2000). In Kuwait, in Hassouna (2005). Found out that most of contractors in Kuwait did not have a safety record. The study in Tripoli city disagreed with the results of Hinze and Wilson (1996). In USA, in Hassouna (2005). And Poon, et al. (2003). In Hong Kong, in Hassouna (2005). Which found out that majority of respondents of their survey in the three countries record and investigate construction injuries and all of them agreed that accidents investigations were vital to improved safety performance. While in Tripoli city, there is shortage and unaware about the importance of the safety issues form the government,

owners, consultants, and contractors. However, recording accidents is considered weak in construction in the Tripoli city. The investigation and recording accident of an accident can provide meaningful to reduce the number of accidents on the construction project.

5.1.4 Accidents Rates on Construction Site Perspective

A high percentage of the respondents believed that the high accidents rates on construction site were due to the first management carelessness with the percentage 56 % (17) (see figure 4.5 reasons of the high accidents rates in construction).The respondents believed that the high accidents rates on the construction site the management careless of many things. Such as there is no the training of workers in the construction projects, and how to use the equipment in the construction sites, and also there is no orientation for the workers, the results in this study agreed with the results of Tam et .al (2004), in China, in Hassouna (2005). which found out that the causes of accidents were due to poor safety awareness for top leaders. Also the results in this study disagreed with the results of Hinze and Harrison (1981), inUSA, in Hassanien (2007). surveyed that nature of safety programs in the largest 100 construction firms in the USA,and concluded that larger firms had more formal safety programs they also had the safest performance, lower injury rates were in companies that provided workers with formal safety orientation.

5.1.5 The Major Reasons of Accident on Site: The Management Perspective

The respondents of survey believed that the top management level of all the construction firms in the Tripoli city participates in increasing accidents rates due to lack employs of safety officer with the percentage 56% (17) (See figure 4.6: the shortage of management).The respondents in Tripoli city believed that the high accidents rates on the construction site the lack employs of safety officer of many things. Such as there is no employee officer to care about the safety performance on the construction sites, and they did not have experience about their works, and without any knowledge to follow up the safety performance the construction projects, and the other hand the cost of the construction safety is not enough to cover the requirements of the safety on the construction site. The result in the Tripoli city lacks of employee of safety officer, and the cost of safety. They are two main factors to increase the accident rates the results in this study it need improve if compare with

other countries. The results of Tam et.al (1998), in Aksorn (2009). These studies were conducted to evaluate the influence of safety program on improved construction safety performance and reveal that successful safety program, however, do not need extensive elements, but should at least include the critical elements including safety policy, safety committee, safety inductions, safety training, safety inspections.

5.1.6 The Major Reasons of Accidents on Site: The Workers Perspective

(19) 63% of the respondents believed that the lack of safety culture is the most important reasons to increase the number of accidents. (See figure 4.7 the role of workers). In the Tripoli city there is no safety culture on the construction sites, due to there is lack of issues safety included all the respondents, and the government, and any part who is responsible to promote the safety culture, the safety performance in Tripoli city it need improve if compare with other countries.

The results in this study agreed with the results of Hassouna (2005) which found out the lack of safety culture (57) 69 % is most important reasons to increase the number of accident on the construction site. The importance of safety training to improve the safety performance in the construction industry has addressed by many researchers Huang et.al (2003) and Aksonrn et. al (2008).Effective training of construction workers can be one of the best ways in improving site safety performance. Positions in the absence of workers safety culture seem to have a significant impact on the implementation of security measures. Should be prepared guidelines and training programs to improve the safety culture of safety workers and their stance on security. Need to educate workers safety rules and procedure, and must be trained in methods of work.

5.1.7 Safety Responsibility

(28) 93 % of all the respondents in the Tripoli city agreed that the contractors are responsible to the accidents in the construction sites, (See the figure 4.8), and 80 % (24) percent of the respondents agreed that all the parts (Contractors, consultants, owners, Government, and also all the reasons) are responsible to the accidents in the construction site. In the Tripoli city, reality the contractors have the responsible to accidents in the construction

site but not alone. Due to the contractor's one of the part are the responsible to accidents in the construction site .but the government, and consultants, also owners, they are responsible to accidents in the construction projects. In this study the respondents believed that contractors are the responsible to accidents in the construction site due to the role of the contractors in the Tripoli city. And the respondents believed that all the parts are the responsible to accidents in the construction sites. (Including contractors, consultant, and owners, also government).

Table (4.1) opinion of the all respondents of the responsible to accidents in the construction site. Table (4.1), 90% (9) of the contractors blamed the all parts should be responsible to apply safety performance in the construction projects .also contractors blamed themselves to the shortage construction safety with (10) 100% in the construction projects. Government and consultants the next indicted form the perspectives of contractors, workers and owners (see table 4.1).On the other hand, consultants put the all parts with the 100% (10) (Government, workers, consultants, contractors and owners) should be responsible for accidents in the construction projects. And also the consultants blamed the Government to the responsible of accidents in the construction projects with 100 % (10), and the workers with (9) 90% on accidents in the construction projects, and contractors and consultants and owners, respectively).while the owners assumed that safety is the responsibility of both contractors with (10) 100% and consultants with degree ((8) 80%). (See Table 4.1) demonstrates opinions of each party about who is the responsible about construction safety.

The results in the Tripoli city disagreed the results of Williamson et.al (1997), in Hassouna (2005). Which found out in Australia almost all respondents agreed with the statement ''safety is the responsibility of both management and worker together. And the results in this study disagreed with the results of Jannadi (1998), in Sudia Arabia. Which found out the responsibility for safety on any construction projects should be shared between all the parties involved in the projects, namely, the owners, the designer or architect and the contractor.

5.1.8 The Role of Governmental Institutions in Improving Construction Safety

Based on the results, (30) 100 % all the respondents agreed that there is no government institution that follow up safety in construction, enlightenment of the construction employs, in applying safety legislation. In Tripoli there is on government follow up to take care about the safety performance in the construction site that is why the number of accidents so mach during the last five years, the study of (Godwin 2011) in Nigeria the similar with study of Tripoli city which found out the industry has no legislation governing OHS, on regulatory authority on construction projects. The results in this study it need improve if compare with other study.

The results in this study also similar with the results of (Jannadi et al. 1998) in Saudi Arabia found out. The practice of safety in Saudi Arabia is not regulated by any government agency. Construction projects in the USA is regulated by government agencies such as the Occupational safety and Health Administration (OSHA), which provides strict rules and regulations to enforce safety and health standards on job sites (OSHA, 1999). In Kuwait, every contractor is required to contact the safety Department of the Kuwait municipality when starting new projects and submit necessary documents (Kartam, etal.2000), in Hassouna (2005).

5.1.9 The Costs of the Construction Safety

(13) 43% of the respondents in the Tripoli city believed that the cost of the construction safety less than 0.5%. Another 16 %(5), estimate the cost 1-<2% (See figure 4.9 the cost of the construction safety).The costs in the Tripoli city is low, due to the safety is not priority in the construction projects. In Kuwait many managers think that safety procedures substantially increase the cost of construction (Kartam etal.2000), in Kuwait, in Hassouna (2005). Which found out that accident costs and safety procedures are not considered in the contractors' bid and only the insurance cost is considered for those items in Kuwait The responding managers of the survey of (Kartam, et al.2000),in Hassouna (2005). Estimated the cost of implementing safety procedures and regulations in Kuwait to be (0.25-2%) of total projects value.Rowlinson (2003), in Godwin (2011). Observes that the in the construction projects the total cost of accidents accounts approximately (8.5%) of the total tender in China .In the Tripoli the majority of contractors did not consider the high cost of safety in the bid.

This is attributed to the competitive tendering and the method which used in awarding the bid to the lower contractors ‘price.

5.1.10 The Clearest Potential Hazards in the Construction Site

The respondents were asked to give examples about the clearest potential hazards in their construction sites. The result shows that there are many potential hazards that could be identified easily during the site visits. (See 4.2.10 : The clearest potential hazards in the sites).The natural projects in the Tripoli city very complicated, and without any organizing, also the construction waste on the construction site, waste on the construction site and the most of the projects without the organizing, can lead to many injuries, and disease the workers on the construction site.

5.2 Part C: To Investigate the Safety Procedures, Regulations, Policies, and Accident Prevention Methods Related to the Construction Projects

5.2.1 Safety Improvement

(Table 4.2) shows that the score for three questions mentioned in the table are more than (2.8.) or agreed these results mean that there was a consensus among the respondents from the three groups of the respondents implementation of safety regulation helps in reducing accidents, and they also agreed that all construction professionals should play more active roles in sustaining constriction safety, and also construction professionals should play more active for construction workers. (Questions part C 1, 10, 14).

The results in Tripoli city of question part C (no.1) in (Table 4.2) the results in this study agreed with a study Hassouna (2005) in Gaza strip. Which found out all respondents (83) 100% agreed that implementation of safety regulation helps in reducing accident with a study of Kartam et al. (2000) in Kuwait, in Hassouna (2005). which found out there were a consensus among the respondents of their surveys that safety regulations is significant in reducing accidents in the construction sites.

Question part C (no.10 and no.14) as show in (Table 4.2) asks if constriction professionals should play an active role in sustaining construction safety and in improving the culture for construction workers. The results enhanced the desire of all construction parties to improve and activate their role towards with the construction safety (See Table 4.2, question part C (no.10)). In this study agreed with the results of Tam et. al (2004),in Hassouna (2005). Which found out identified that poor safety awareness of firm's top leaders and safety awareness of project managers as the main factors affecting construction safety performance in China the results in China were matching with the results in the Tripoli city A study by Hinze and Gambatese (2003), in Hassanein (2007).Agreed with (Question part C no.14) which found out concluded that specialty contractors'saftey performance was consistently influenced in part by a number of factors. The factors to improve safety performance: minimizing worker turnover; implementing employee drug testing and training of workers (See Table 4.2, Question part C no.14).

5.2.2 Construction safety responsibility

According to the result of the question if construction safety responsibility confined only to those working in this field or not, from question part C (no.2) the score for the three parties approaches to (1) (disagree-DA).100% (10) of contractors (10 DA),100%(10) of consultants (10 DA) and 100% (10) of owners (10 DA) believed that safety is not confined only to those working in the field, but the extends to any party who could affect the safety performance in sites such as government and insurance companies (Table 4.3).The results in this study agreed with a study of Hassouna (2005) in Gaza strip. which found out that safety is not confined only to all working in construction sites but also to government and insurance company's owners, contractors, .They are all responsible of the safety in construction sites. Also the results in this study agreed with the results of Jannadi (1998) in Sudia Arabia which found out The responsibility for safety on any construction projects should be shared between all the parties involved in the projects, namely, the owners, the designer or architect and the contractor.

Question part C (no.3) (Table 4.4) was asking the respondents about the responsibility of workers. The score for the three parties were (3), which means that the all of respondents

agreed that workers have bad safety culture which contributes to increase accident rates in constructions projects. Moreover, actually the construction sites, workers did not care about wearing safety tools.

This bad workers' safety was attributed mainly to the lack of safety training and safety directing. The results also show that 100% (10) of contractors, 100% (10) of consultants and 100% (10) of owners agreed that workers have a safety responsibility and believed that if there is parties or persons who care about improving construction safety, they could obligate workers to behave safety, instruct and directing them, arrange safety training programs for workers ,and then the results will be better .Table (4.4) shows the results and percentages of the opinions of each construction party (contractors,consultants,and owners).

Question part C (no.3) (Table 4.5) asks the respondents about the responsibility of supervision /consultants. The majority of participants agreed that consultants have the power and the authority to force all employees in sites to comply with safety provisions .They also should participate in improving contract conditions by making them stricer.The results in this study agreed with the results of Hassouna (2005) in Gaza strip. Which found out (22) (44%) of contractors, (70%) (14) Of owners agreed that consultants have the power and the authority to force all employees in sites to comply with safety provision.

Table (4.6) show that all 100% (30) of the respondents agreed that designers should be responsible for build ability and safe construction working and they should have regular site visits to ensure safe construction as specified and record mistakes and notes which could be avoided in the next designs (Question part C No.11).

The results in Tripoli city agreed with the results of a study of Hassouna (2005) which found out 49% (41) of the respondents agreed and 40% (33) of them strongly agreed that designers should be responsible for build ability and safe construction working and they should have regular site visits to ensure safe construction as specifies and record mistakes and notes which could be avoided in the next designs.

Actually the role of architect or designer towards ensuring the safety of the projects by properly designing the temporary and permanent work form the safety point of view .Also the

designer should be visit the construction site and make sure all the tools safe during the life cycle of projects.

(Question part C No.12) asked if owner's institutions should include subject of safety in the bid entry. Table (4.7) shows the results and the percentages of the respondents. All respondents agreed that owners should include subject of safety in bid entry and bid. The results in the Tripoli city agreed with the results of Kartam et .al (2000) in Kuwait, in Hassouna (2005). Concluded in their study that owners, as part of his safety responsibilities, must ensure that the designer designs a safe project. He must also ensure that the contractors have a safety program. The owner should include the safety program as an element of the bidding technicalities.

In the case of accidents, the respondents were asked in Question part (C No.15) if contractors have the whole responsibility towards safety in the sites. (Table 4.8) shows that the score for contractors was (1) or disagreed. The table shows that 100% (10) of contractors disagreed to hold the contractor the responsible for construction safety, because all parties should and owners have the power to apply the safety provisions in the site.

Table (4.8) also shows that all consultants and owners agreed that contactors are the only responsible for construction safety where the score for them approached to (3). The results in this study disagreed with Williamson, et.al (1997), in Hassouna (2005). which found out in Australia, almost all respondents agreed with the statement ''safety is responsibility of both management and the worker together. In reality all the respondents are responsible of case accidents on the construction site.

The majority (8) 80% consultants and (10) 100% owners agreed to stop the contractor in preceding the work when he made safety violations (Table 4.9). This may be assumed as a punishment for contractos.While 100% (10) of contractors ((1)10% N plus (9) 90% DA) believed that this way will not reduce accident rates because most of projects delay. However, applying safety measures and improving the safety awareness in construction sites could be a good solution before the occurring of the accident and to avoid the problems which follow the occurring of the injury. The results in the Tripoli city agreed with the result Hassouna in the Gaze strip (2005).which found the majority of consultants with (54%) (7) and owners with

(75%) (15) Agreed to stop the contractors in preceding the work when he made safety violations.

5.2.3 The role of Government institutions and the insurance companies

There was a consensus among the respondents that special governmental institutions should increase their effort and participate in improving construction safety by organizing safety-training course for workers, foremen, supervisors, and follow up the construction projects, engineer. They should enact safety regulations; arrange sudden site visits and punish those who make safety violations; and enlighten them by safety bulletins (Table 4.10). (10) 100% of owners and (10) 100% of consultants and (10) 100% of contractors agreed to think that safety should be followed continuously, and governmental institutions could apply that. The results in the Tripoli agreed with of the Kartam et.al (2000), in Kuwait, in Hassouna (2005). Which found out that the respondents for their survey agreed that the government should play an important role in safety management in the construction industry. However (3) 30% of contractor believed that the government could not apply their effort and participate in improving construction safety due to the size and the huge numbers of construction projects and the need to large numbers of government employees to cover that.

As to the question on the degree of knowledge on the current safety regulations, the score for the three parties approaches to (1) (Question part Cno.5 -Table 4.11) which means disagree the respondents do not have a good knowledge of the current regulations regarding construction site. The results in this study similar with the results Hassouna in Gaza strip (2005). which found out the majority of the respondents believed that the current regulations are inadequate. More than 31% (26) of respondents could not tell if the current regulations were adequate to take care of the safety of the workers. But in general certain that applying these regulations will be adequate and in any way will be better than the working without any laws or regulations.

The results question part (C on.6) shows in (Table 4.11) that all the respondents disagreed that Ministry of Labor gives information about the current safety regulation .In (Table 4.11), the results of question part (C no .7) show that the score for each party is also

(1), which means that the majority of the respondents believed that the current regulations are inadequate.

In the Tripoli city all the respondents believed that the current regulations were not practical and could not be applicable in the Tripoli city construction industry in the Tripoli city. The results in this study agreed with results Hassouna (2005), in Gaza strip. which found out 37% (31) of the respondents believed that the current regulations were not practical and could not be applicable in construction industry.

Questions part C 8 and 9 in Table (4.12) ask if delegated persons from the ministry of labor or from the insurance companies arrange sudden visits to construction sites. The results listed in Table (4.12) show that both the ministry of labor and insurance companies are less care in following safety issues in the construction sites. But in general, the rates of visits by the two parties were very bad there on visits on the construction projects, but the respondents believed that increasing visits on the construction projects will change this issue to be more serious, and that will be help to reduce the accidents on the construction projects. The results in the Tripoli city disagreed with the results of Hassouna (2005) in Gaza strip. which found out insurance companies care more that the ministry of labor in following safety issues in the construction sites, where 30% (25) of the respondents agreed that the insurance companies arrange safety site visits and 14% (12) of them only agreed that the ministry of labor arrange such visits. The care of the insurance was more the government due to the need to reduce accidents which help in reducing the costs of compensations.

5.2.4 Safety and Total Quality Management

In table (4.13) Questions (Part C 17), all of the respondents from contractors, consultants and owners agreed with score (3) that the implementation of total quality management in construction industry could reduce accidents. The results in this study agreed with the results of Hassouna (2005) in Gaza strip .which found out all the respondents (83) 100% agreed implementation total quality management help to reduce the accident in the construction projects.

5.3 Part D: To Provide Methods and Suggestions to Improve the Safety Performance in the Construction Projects

5.3.1 Reporting Accidents and Safety Violations

The results in the Tripoli city (30) 100% all the respondents did not care about reporting accidents, hazards, or violations just the real injuries the results in the Tripoli city it need improve if compare with the other countries. This carelessness in the safety recording among the respondents in Tripoli city was attributed into one main reason: the first is that respondents did not recognize the benefits of the safety recording in improving the safety in construction and to prevent future accidents. A subsequent study by (Hinze and Raboud 1889), in Hassanein (2007). On large building construction projects in Canada shows that larger firms generally had better safety records. Hinze and Wilson (1996), in Hassouna (2005). Believed that reporting and investigating accidents were vital in improving safety performance in the construction projects.

5.3.2 Contracts/Owners-Safety Conditions Relationship

All the respondents (30) 100% agreed there is no relationship between the contract and owners and safety conditions such as stopped the contractors when he made the safety violations the results in Tripoli it need improved if compare with other countries. In the study of Hassouna (2005). In Gaza strip which found out 53% (44) of respondents believed that a few owners 'institutions care more in safety conditions in its own contracts ,such as UNDP and UNRWA contracts include strong provisions and sometimes a penalties against contractors who made safety violations.

5.3.3 Penalties against Contractors

All the respondents (30) 100% in the Tripoli city agreed there is no a strict measure against the contractors who makes a safety violation in the construction site, in Tripoli there is no penalties against contractors, due to lack of legislation and lack to apply safety in the construction sites . The results in the Tripoli it need improve if compare with the other countries. A study of Hassouna (2005) in Gaza strip which found out 25 % (21) of the respondents were found that stopping the work, when an injury or safety violation happened,

were considered as a penalty because stopping the execution causes loss in the overhead, productivity and may delay the projects. And the respondents blamed the government to apply penalties against contractors when makes safety violation.

5.3.4 Safety Training

All the respondents (30) 100% of the did not received any safety-training course. The results the Tripoli city it need improve if compare with the other countries. A study of Hassouna (2005) in Gaza strip which found out 24% (20) of the respondents were received safety-training courses and all of them achieved a good benefit from it. The main course which was received included the first aid courses, causes of accidents, ways to prevent accidents, the safe of scaffolds, and using safety tools. And also he found out part of them from the respondents received safety training in abroad such as in Saudi Arabia and UAE and the other part received training courses in the Syndicate of Engineering and in the Contractor Union. There was shortage from the government to improving safety performance on the construction projects, and provides the programs of training of safety for all the respondents.

5.3.5 Organized Safety-Training Courses for Managers, Engineers and Labors

All the respondents (30) 100% of (Contractors, consultant, owners) did not have safety training courses for their managers, engineers, supervisors or labors .The results in the Tripoli it need improved if compare with the other countries, A study of Hassouna (2005), in Gaza strip which found out 10 % (8) of the respondents among (83) respondents concern about training the labors only on how to use equipment and how to perform the danger activity safely, but the other respondents 90% (75) they do not have any training for their workers, engineers, labors. The respondents blamed the government about the programs to training the courses for managers, engineers, labors.

5.3.6 Training Workers for Improving Construction Safety

(30) 100% agreed that training workers are necessary to improve construction safety. The results in the Tripoli city agreed with the results Dingsdag et al. (2008). Which found out construction workers identified training as a necessary element of safety performance.

5.3.7 Chance to Receive a Safety-Training Course

The respondents asked if safety training course is allowed to you, what the subjects you desire to receive all the respondents (30) 100% said the First aid courses, safety policy, and safety reporting how to use equipment. The results in this study agreed with results of findings Huang et .al (2003) and Aksonrn et al (2008). Which found out Effective training of construction workers can be one of the best ways in improving site safety performance.

5.3.8 Conducting Safety Inspections

The results in the Tripoli city all the respondents (30) 100% agreed there are no conduct special safety inspections in the construction sites. The results in the Tripoli city similar to the results (Godwin 2010) in Nigeria which found out the industry has no legislation governing OHS, no regulatory authority on OHS, accident and injuries are not reported and clients, consultants and contractors give little or no attention OHS. The results in this study it need improve if compare with other countries, Hinze and Wilson,(1996) ,in Hassouna (2005).In their research which found out that in USA, the majority of respondents of their survey record and investigate construction injuries and all of them greed that accident investigations were vital to improved safety performance. In Hong Kong, accident reporting& investigation program was which found out to be most significant contributor to reduce site accident frequency rate. (Poon, Ma and Ho, 2003), in Hassouna (2005).

5.3.9 Safety Tools

(See Table 4.14 safety tools) illustrates the results and the average percentage of the participated firms in the Tripoli city that concern about using of safety and emergency tools in construction sites. When ranking the listed seven tools, the result found that the concern in using first aid came in the first degree with score (4). The second Hard hats bags with score (3.80), and safety footwear, are in the next degree of concern respectively, and then the use of fire protection, eye protections, emergency telephone numbers, and other emergency tools had less concern from the previous tools. The use of first aid bag hard hats because the price of this tools better than the other tools. The results in the Tripoli city agreed with other countries .A study of Hassouna (2005) in Gaza strip .which found out the using hard hats with score

(2.90) came in the first degree, and also the First aid bags with score (2.85) and emergency telephone number , and safety footwear are in the next degree.

5.3.10 Safety Policy

The respondents asked if there is clear safety policy in their construction projects all the respondents (30) 100% in the Tripoli city did not have a written policy in their firms or their construction projects ,this reflects the respondents' in the Tripoli city unawareness about the significance of the benefits of the written safety policy towards improving the construction safety. Evelyn, Florence and Adrian (2005), in Hassanein (2007). presented the results of a postal survey of contractors in Singapore. The findings revealed that site accidents are more likely to happen when there are inadequate company policies.

5.3.11 Safety Meeting

The respondents asked if there is safety meeting during their construction projects, all the responding agreed (30) 100% there is no safety meeting during the construction sites. The results in the Tripoli city it need improve. Tam et al (2004) in China, in Hassouna (2005). Believed that regular safety meetings are necessary for communicating safety information to all parties. 36% of the respondents for their study claimed that they had regular safety meetings, and the other indicated that safety issues were discussed and presented at other meetings, such as construction planning meetings. Study by Hinze and Raboud (1988), in Hassanein (2007). concluded that lower injury rates were noted on projects that employed safety officer those which conducted job site safety inspections and those which included safety in coordination meetings.

5.3.12 Respondents suggestions

Regarding officials, the government should be provide special programs and follow up the safety performance on the construction site, and visits all construction projects also made the violation during the visits to the construction sites. Also the role of contractors, consultants, and owners should provide the safety programs, such as training workers, educate the workers, and orientation them, and promote the safety culture on the construction site, also the insurance company must visit construction site to have insured.

CHPTER VI

CONCLUSION AND RECOMMENDATIONS

This chapter includes the conclusion and recommendations to improve the safety performance in construction sites.

6.1 Conclusion

The results in the Tripoli city highlighted the bad safety situation where most of the respondents in the survey had accidents in their construction projects during the last five years. Accidents rate mentioned by the contractors (80%) was higher than with the other respondents i.e., the consultants (60%) and owners (70%). This was attributed to the fact that the contractors execute projects with size and values more than the owners and consultants.

There was no detailed record for the size and number of accidents, as the data available only showed the real injuries. Management carelessness, lack of safety officer and safety culture were the main reasons contributed to the increase of rate of accidents in the construction sites. Other than the contractors' responsibility for causing accidents in the construction sites, the absence of government follow up on the construction projects and the failure to improving the safety performance on the construction sites were also responsible for the high number of accidents. Regarding the cost of the construction safety, the majority of the respondents agreed that the cost of safety less than 3 % during the last five years. There were many potential hazards in the sites which can lead to many injures, or disease among the works on the construction sites.

On the existing safety procedures, regulations, policies, and accidents prevention methods related to the construction projects; there was a consensus among the respondents that implementation of safety regulation helps in reducing accidents. Construction professionals should play more active roles in sustaining construction safety and in improving safety culture for construction workers. There was also a consensus between the respondents that responsibility for safety and health was only confined to construction work on site.

The respondents agreed that the main cause of accidents on site during the last five years all was that because the workers were lacking of safely knowledge. The majority of the respondents also agreed that consultants carried both a moral responsibility and duty of care for building demolition workers and public in general. The respondents agreed that design engineer should be responsible for the building ability and safe construction working and they should have regular site visits to ensure safe constriction as specified, while for the owners, subject of safety should be included in the construction bid entry. The majority of respondents who were consultants and owners agreed that contractor was responsible for the cases of accident and that the contractor should be stopped when making safety violations,

There was a consensus among the respondents that special government institutions should increase their effort and participation in improving safety by organizing safety-training course for workers. All the respondents disagreed on the matters such as whether the contractors had a good knowledge of the current regulations regarding construction site, whether the ministry of labor gave adequate information about the current safety regulations for contractors, and whether the current regulations were adequate and applicable to the local construction sites. On the other hand the respondents agreed on the notion that delegation from the ministry of labor should visit the construction sites to follow up safety performance, and for the insurance companies to visit the sites for the insured projects. During the last five years the respondents agreed that implementation of total Quality management could help reduce the number of accidents on the construction site.

During the last five years all the respondents agreed on the lack of methods that can help improve safety performance in the construction projects, accident reporting, contractors/owners' safety conditions relationship, penalties against contractors, and safety meeting. Regarding the tools most widely used and available in construction sites, first aid bag and hard hats came on top of the list. Regarding officials, the government should provide special programs and follow up the safety performance on the construction site and visits all construction projects to check for any violation in the construction sites. On the role of contractors, consultants, and owners, safety programs, such as workers training, education and orientation should be provided to promote the safety culture on the construction site. Finally,

the respondents agreed that insurance company must visit construction site which have been insured.

6.2 Recommendations

Several recommendations are suggested here on the role of each party involved in construction projects, including the government, the insurance companies, the owners, the consultants, and the contractors.

6.2.1 The Government

- The government should establish the Department of Occupational Health and Safety Administration (OHSA) with the strong terms of punishment for those who make safety violation.
- The government should follow up the safety performance in the construction sites by visiting the construction site and evaluating the safety performance during the construction project.
- The government should provide safety courses on how to improve safety performance in the construction sites for officials of safety in the construction projects, which is to be held annually.

6.2.2 The Insurance companies

- The insurance companies should visit construction sites to monitor the safety performance in the construction sites.

6.2.3 The Consultants

- The consultants should visit the construction sites to make sure all the tools used in the construction site are safe.
- The consultants should determine the factors that can cause accidents in the construction site such as the bad use scaffolding and stairs and minimize them during the construction project.

6.2.4 The Owners

- The owners should control and mentor the contractors and consultants by giving safety training to workers, promoting safety culture in the construction site and by making sure that the consultants inspect the safety of the tools used in the construction sites.

6.2.5 The Contractors

- The contractors should train the workers, promote the safety culture for workers and educate them on how to avoid the risk and use the equipment properly in the construction site.
- The contractors should prepare the regular safety meeting during the work in the construction site.
- The contractor should make sure that all the workers wear the personal protection equipment and punish the workers who make safety violation.

6.2.6 Recommendation for further research

This study reviewed thirty safety officials in the construction projects. The next studies may take in consideration on the number of participants so that more than thirty participants can take part to investigate more about the safety performance in the construction projects in the Tripoli city.

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Appendix I:

Three item questionnaires are prepared to asking for information occupation of respondents and, the experience of the person who will respond and the number of projects executed in the last five years. Show the questions of this part:

Part (A)

Respondents' Profile

1- Occupation of Respondents**:**

☐ Contractor ☐ Consultant ☐ Owners

2- Experience of years.

☐ Less than 1year ☐ 1-<3 years ☐ 3-<5 years ☐ 5 -< 10 years

☐ More than 10 years.

3- Number of projects executed in the last five years.

☐ Less than 10 ☐ 11-< 20 ☐ 21- <30 ☐ More than 30

Part (B)

Accident Causes, Rates and Cost.

7- Did Accidents happen in your executed projects in the last five years?

☐ Yes ☐ No

The degree of the injury:

☐ Death ☐ permanent inability ☐ partially inability ☐ Light injury

☐ Other

8- Is there a health and safety reporting?

☐ Yes ☐ No

9-High accident rates on construction site are due to :

☐ Lack of Legislation ☐ Lack of Safety Knowledge ☐ Management Carelessness

☐ Careless worker attitudes ☐ Carelessness of the Consulting ☐ All reasons.

10-The major reasons of accident on site are that the management is short of:

☐ Lack employs of Safety Officer ☐ Lack of Safety policy ☐ Lack of Safety Training

☐ Lack of Safety Motivation ☐ The cost of Safety ☐ Other……

11-The major reasons of accident on the site are that the workers are short of:

☐ Lack of training ☐ Lack of experience in using equipment

☐ Lack of safety culture ☐ Lack of safety Motivation ☐ other……..

12- In your opinion, who should be responsible for industrial accident during construction on site?

☐ Workers ☐ Government ☐ Contractors ☐ Owners

☐ Consultant ☐ All

13- Is there a governmental organization follow up and contribute in improving safety in the Construction projects?

☐ Yes ☐ No

If yes, who is this? And how it works?

……..

14-What is your suggested expense in safety management in the terms of contract cost in construction projects?

☐ Less than 0.5% ☐ 0.5-<1% ☐ 1-<2% ☐ 2-<3% ☐ More than 3%

15-In your last visit to site, you might easily identify some potential hazards around, please state some cases below:

……

……..

……..

……

……

Part (C) Safety Roles and Responsibilities

16- Please tick the appropriate item that you, disagree (**DA**), and (**neutral**), and Agree (**A**).

		DA	**Neutral**	**A**
1	Implementation of safety regulations helps in reducing accidents.			
2	Responsibility for safety and health in only confined to construction work on the site.			
3	The main cause of the accidents on the site is the workers lack for safety knowledge.			
4	Consultants carry both a moral responsibility and a duty of care of building /demolition workers and public in general.			
5	You have a good knowledge of the current regulations regarding construction site.			
6	The ministry of labor gives adequate information about the current safety regulations for contractors.			
7	The current regulations are adequate and applicable to the local construction sites in Libya especially in the Tripoli city.			

		DA	Neutral	A
8	A delegate from the ministry of labor visits the construction sites follow up safety performance.			
9	Insurance companies visit the sites for the insured projects.			
10	Construction professionals should play more active roles in sustaining construction safety in Libya in especially in the Tripoli city.			
11	Design engineer should be responsible for build ability and safe construction working and visits to ensure safe construction as specified.			
12	Owners should include subject of safety in the bid entry.			
13	Special government institutions should increase their effort in the field of construction safety.			
14	Construction professionals should play more active roles to improving safety culture for construction labors.			
15	The contractor is the Responsible in the case of accidents.			
16	The contractor should be stopped when he made safety violations.			

17	Implementation of total Quality Management in the construction industry can reduce accident.			

Part (D)

Improving Construction Safety in Tripoli city

17- Is there a recording for accident and violations during your executed projects?

☐ Yes ☐ No

18- Is there a relationship between the contract type/owners representatives and safety items in the contract?

☐ Yes ☐ No

How?.....

19-Is there strict measure against the contractor who makes a safety violation during the executing of their projects?

If yes, how? And if not, why?

☐ Yes ☐ No

……

20-Did you ever attend safety training course?

☐ Yes ☐ No

If yes, state where did you receive the training and what is the subjects?

And were you benefited from it?

☐ Yes ☐ No

Why?.....

21- Have all workers and engineers received general safety training in construction?

☐ Yes ☐ No

If yes how? And if not, why?

……..

22-Training workers for improving construction safety?

Yes No

☐ ☐

23- If safety tr ng course is allowed to you, what are the subjects you desire to receive?

……..

24-Are there safety visits and inspections for Construction sites?

☐ Yes ☐ No

If yes, who does it, and are there any analyzing for these results

……

25- Is the following found in your working sites?

		Always	**Some times**	**Rarely**	**No**
1	First aid bag				
2	Emergency telephone numbers				
3	Eye protection				
4	Hard hats				
5	Safety footwear				
6	Fire protection				
7	Emergency tools				

26- Is there a clear safety policy for your organization and projects?

☐ Yes ☐ No

If yes is there effective arrangement for reviewing policy every year?

……

……

27- Is there a regular safety meeting during the executing of your projects?

☐ Weekly ☐ Monthly ☐ After an accident

☐ Depend on The nature of The Accident ☐ Other

28-In your opinion, any other suggestions you would suggest to improve construction safety:

……..

……..

Appendix II:

- **For calculate the score and calculate the percentage weight**

Table 4.2: The need to improve safety (Question part C1; 10; 14).

The likert scale consist (**Agreed** (A) =3, **Natural** (**N**) =2, **disagree** (**DA**) =1).

Score /Three likert scale = Percentage weight or (PW)

The score =100/100*3= 3 (score)

3/3*100= 100% (PW)

90/100*3+10/100 *1 = 2.8 (Score)

2.8/3*100=93% (PW)

Table 4.3: construction safety is only confined to construction work on site

100/100*1 = 1(score)

1/3 (Likert scale)*100= 33% (PW)

Table 4.4: safety culture for construction workers

The score 100/100*3= 3(score)

3/3(Likert scale)*100=100% (PW)

Table 4.5: Consultant's responsibility towards construction safety

90/100*3+10/100*2=2.7+0.2= 2.9(score)

2.9/3(Likert scale)*100=97% (PW)

100/100*3=3(score)

3/3(Likert scale)*100=100% (PW)

Table 4.6: Designers responsibility towards safety

100/100*3=3 (score)

3/3 (Likert scale)*100=100% (PW)

Table 4.7: owner Role towards safety

100/100*3= 3 (score)

3/3(Likert scale)*100=100% (PW)

Table 4.8: contractors Responsibility toward construction safety

100/100*1=1 (score)

1/3(Likert scale)*100=33% (PW)

100/100*3=3(score)

3/3*100=100 % (PW)

Table 4.9 stopping contractors to proceed in working

10/100*2+90/100=0.2+0.9=1.1 (score)

1.1/3(Likert scale)*100=37 %(PW)

80/100*3+20/100*2=2.4+0.4= 2.8 (score)

2.8/3(likert Scale)*100=93% (PW)

100/100*3= 3 (score)

3/3(Likert scale)*100=100% (PW)

Table 4.10: The Role of Government institutions towards construction safety

70/100*3+30/100*1=2.1+0.3=2.4 (score)

2.4/3(Likert scale)*100=80% (PW)

100/100*3(Likert scale) =3(score)

3/3(Likert scale)*100=100% (PW)

Table 4.11: Construction safety regulations

100/100*1=1 (score)

1/3(Likert scale)*100=33% (PW)

Table 4.12: Ministry of labor and the insurance company visits the site

100/100*1= 1 (score)

1/3(Likert scale)*100=33% (PW)

Table 4.13: Safety –Total Quality Management Relationship

100/100*3= 3 (score)

3/3(Likert scale)*100=100% (PW)

Table 4.14: Using safety Tools in construction Sites

The likert scale consist (**Always**=4, **Sometimes**=3, **Rarely**=2, **No**=1)

- First Aid bag=100/100*4= 4 (score)
- Emergency Telephone Number=3.33/100*3+60/100*2+36.66/100*1=1.67 (score)
- Eye protection=20/100*3+33.33/100*2+46.66/100*1=1.73 (score)
- Hard hats =80/100*4+20/100*3=3.80 (score)
- Safety footwear =70/100*4+23.33/100*3+3.33/100*2+3.33/100*1=3.60(score)
- Fire protection=3.33/100*4+13.33/100*3+50/100*2+33.33/100*1=1.87(score)
- Other Emergency Tool=3.33/100*3+30/100*2+66.66/100*1=1.37(score)