

## Safety Management in the Jordanian Construction Industry

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### ABSTRACT

The Jordanian society and economy have suffered human and financial losses as a result of the poor safety record in the construction industry. The purpose of this study is to examine safety management in the Jordanian construction industry. The study collects data from 70 general contractors, who are involved in all types of construction. Collected data include information regarding organizational safety policy, safety training, safety meetings, safety equipment, safety inspections, safety incentives and penalties, workers' attitude towards safety, labor turnover rates and compliance with safety legislation. The study reveals several factors of poor safety management. Among these are lack of safety training, occasional safety meetings, occasional safety inspections, unavailability of safety protection measures, hesitance of workers to use safety equipment, high labor turnover rates and non-compliance with safety legislation. The paper concludes by providing a set of recommendations to contractors and governmental bodies to improve safety performance.

**KEYWORDS:** Safety and health, Construction.

### INTRODUCTION

Globally, the construction industry is still considered as one of the most hazardous industries (Hinze, 2008). Construction safety as a result continues to represent a problem and pose a challenge for researchers and practitioners. In Jordan, both the society and economy have suffered human and financial losses as a result of the poor safety performance in the construction industry. Annual reports published by the Ministry of Labor (1995-2005) indicate that the number of work accidents for all industries has continued to increase at alarming levels. Even though construction labor accounts for about 7.1% of the labor force, the Occupational Safety and Health Institute (OSHI) in Jordan reports that accidents in the construction industry account for about 10.5% of incidents (OSHI, 2006).

The Ministry of Labor in Jordan takes full responsibility for legislating and enforcing safety regulations (Articles 78-85 of the 1996 Labor Law).

These regulations target all industries. The regulations are criticized because they are concise. Several major safety issues are not described in enough detail. For example, the specifications for safety equipment are not stated. This leaves such requirements and others to be solely judged by employers.

The purpose of this study is to examine safety management in the Jordanian construction industry. Safety research within the construction domain identifies eight vital factors that drive safety performance. El-Mashaleh et al. (2009) list these factors and summarize key statements made by previous research as shown in Table 1.

### RESEARCH METHODOLOGY AND DATA COLLECTION

Data for the study was collected by an interview questionnaire. The questionnaire consists of two major parts: firm's general information and firm's administration of safety. The first part collects information regarding industry sector and number of

workers at the firm. The second part collects information regarding drivers of safety performance shown in Table 1. Compliance with safety legislation information based on Article 85 of the 1996 Labor Law is collected as well. This article dictates the

requirements for safety committees at the firm level and the minimum number of safety personnel. For example, for firms with labor size between 201 and 500 workers, the requirements call for at least 3 safety personnel and a safety committee.

**Table 1: Factors that drive safety performance, Source: El-Mashaleh et al. (2009)**

Factor	Research	Key statements
Organizational safety policy	Hinze and Wilson (1999); Sawacha et al. (1999); Wong et al. (1999)	Organizational safety policy is a major driver for better safety performance in the construction industry.
	Jaselisks et al. (1996)	Better safety performance involves the development of more detailed written safety programs.
Safety training	Construction Industry Institute (CII) (1993)	Safety training is one of five high-impact zero accident techniques.
	Hinze and Wilson (1999)	Worker training is vital to improved safety performance.
	Huang and Hinze (2003)	The lack of safety training is often a contributing factor to many falls.
Safety meetings	Jaselisks et al. (1996)	To improve safety performance at the project level, it is recommended to increase the number of formal safety meetings with supervisors.
Safety equipment	Chi et al. (2005)	Falls are associated with lack of complying scaffolds, unguarded openings, inappropriate protections, removal of protections and improper use of Personal Protective Equipment (PPE).
	Duncan and Bennett (1991)	Both active measures and passive measures are needed to reduce fall injuries.
	Toole (2002)	Some construction accidents result because safety equipment necessary to perform the job safely is not present at the location of the work.
Safety inspections	Hinze and Wilson (1999)	More jobsite visits are needed to improve safety performance.
	Jaselisks et al. (1996); Wong et al. (1999)	Safety performance is affected by site safety inspections.
Safety incentives and penalties	CII (1993)	Safety incentives are among the top five high-impact zero accident techniques.
	Jaselisks et al. (1996)	There is a need to increase fines to workers with poor safety performance.
	Tam and Fung (1998)	Safety incentives should be utilized to improve safety performance.
Workers' attitude towards safety	Abdelahamid and Everett (2000); Aksorn and Hadikusumo (2008); Hinze (1997); Toole (2002)	Workers' attitude towards safety is one of the root causes of accidents.
Labor turnover rates	Harper and Kohen (1998); Hinze and Gambatese (2003)	Higher turnover rates are associated with higher injury rates.
	Hinze (1981)	New hires are more subjected to accidents.

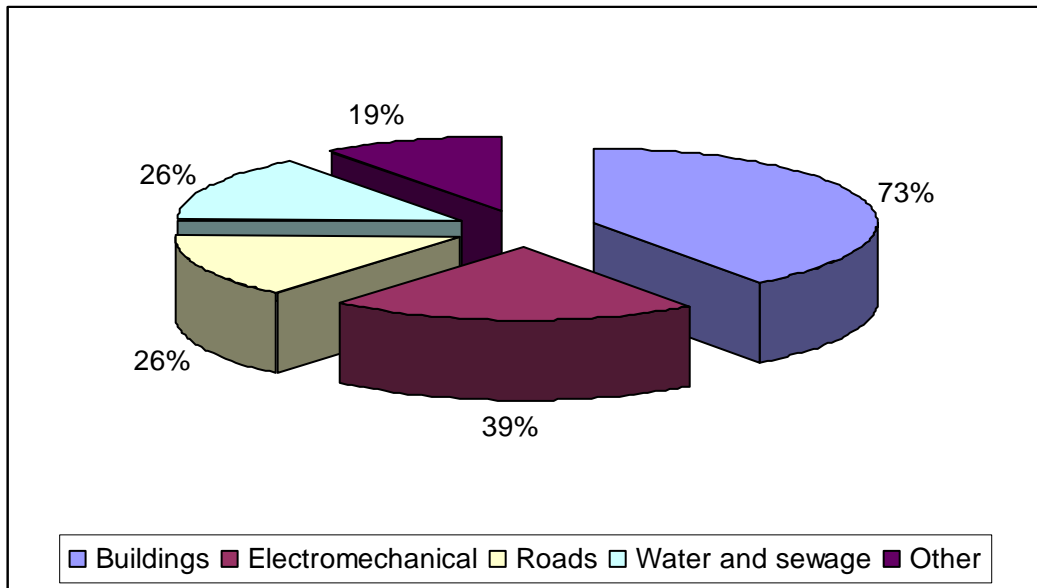


Figure 1: Contractors industry sectors

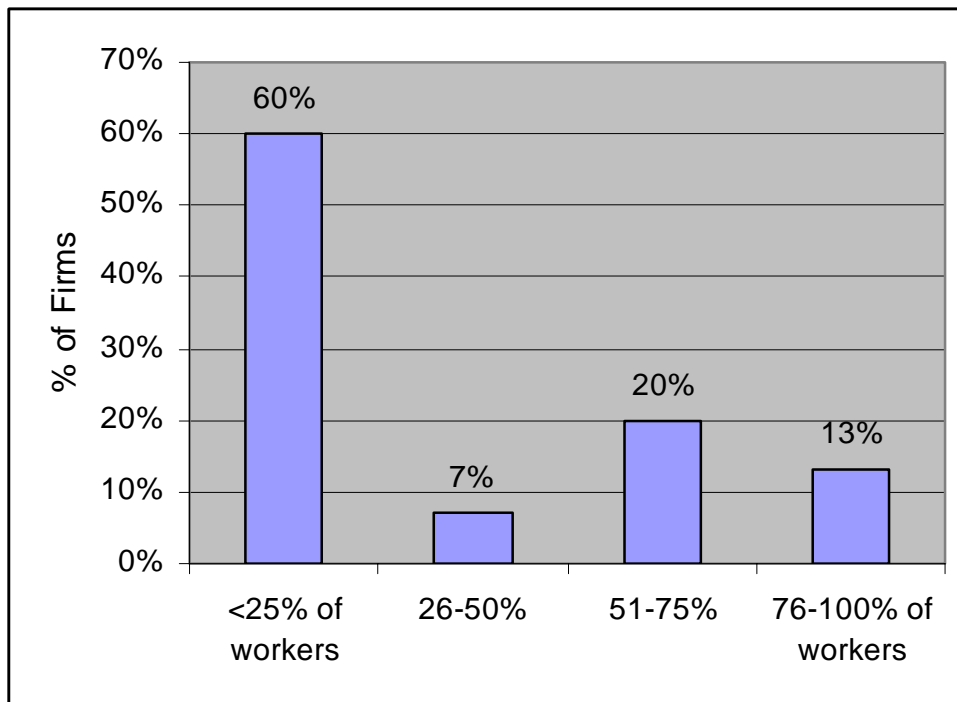


Figure 2: Percentage of workers who received formal safety training

The list of potential participants in the interview questionnaire was compiled from member lists of the Jordanian Contractors' Association. Out of 164 contractors who were contacted for potential participation in the study, 70 contractors agreed to participate in the research project. A questionnaire was forwarded to a company only if it had been contacted in advance and only if it had agreed to participate in the study.

The participating contracting organizations are

involved in all types of construction. With some of the contractors involved in more than one type of construction, Figure 1 shows that 73% of contractors are involved in building construction, 39% are involved in electromechanical projects, 26% are involved in road construction, 26% are involved in water and sewage projects and 19% are involved in other types of construction (building maintenance, steel structures,... etc.).

**Table 2: Availability of safety protection measures, availability of PPE and frequency of posting safety signs**

	always	mostly	sometimes	rarely	not available
Availability of safety protection measures at the jobsite such as guardrails, handrails, warning barriers, protective partitions and others.	1%	7%	44%	32%	16%
Availability of PPE to workers such as hard hats, safety glasses, gloves, face shields and others.	1%	51%	32%	10%	6%
Frequency of posting safety signs and posters at the jobsite.	21%	27%	23%	29%	0%

**Table 3: Number and percentage of firms that meet the requirements for safety committee and minimum number of safety personnel (Article 85 of the 1996 Labor Law)**

Number of workers	Number of firms	Number and (%) of firms that meet the safety committee requirement	Number and (%) of firms that meet the minimum number of safety personnel requirement
<20	21	NA	NA
20-50	19	NA	5 (26%)
51-200	14	4 (29%)	4(29%)
201-500	16	6 (38%)	3(19%)

## RESULTS, ANALYSIS AND DISCUSSION

### Organizational Safety Policy

Sixty-six percent of the respondents indicated that their firms have an organizational safety policy. The absence of an organizational safety policy for about one-third of the participating contractors is a clear indication that these firms do not view safety as an issue of strategic importance to them. Sawacha et al. (1999) argue that the most influential factor driving safety performance in the construction industry is the organizational safety policy. Wong et al. (1999) consider that written safety policies are essential to construction safety. Hinze and Wilson's (1999) study participants recommend a safety system of checks and balances to improve safety performance. Jaselisks et al. (1996) advocate that better safety performance involve the development of more detailed written safety programs. Their study reveals that good safety performance contractors have more detailed written safety programs compared to poor safety performance contractors.

### Safety Training

Figure 2 shows the percentage of workers who

received formal safety training in the participating firms. Sixty percent of the firms conduct formal safety training for only one-quarter or less of their workers. Only 13% of the firms provide formal safety training for most of their workers.

These results reflect the fact that a considerable number of workers are not trained to recognize and avoid the risks associated with their tasks. This leaves those workers more susceptible to potential accidents. CII (1993) study identifies safety training as one of five high-impact zero accident techniques. Hinze and Wilson (1999) indicate that there is unanimous agreement among the respondents of their study that worker training is vital to improved safety performance.

### Safety Meetings

Regular safety meetings are necessary to communicate safety information to all parties. Wilson and Koehn (2000) describe a construction company required daily "tool box" safety talks each morning for their employees:

"These talks lasted for about 10 minutes and included a description of the work to be accomplished that day. In addition, appropriate safety information for the task(s) to be undertaken was discussed by the

foreman or job superintendent. The information presented was generally obtained from the company safety manual."

The results of this study show that 10% of the firms conduct "tool box" safety talks weekly, 9% biweekly, 36% monthly and 45% conduct these talks occasionally.

To improve safety performance at the project level, Jaselisks et al. (1996) recommend increasing the number of formal safety meetings with supervisors. Jaselisks et al. (1996) indicate that firms with better safety performance held more meetings compared to firms with poor safety performance. The results of this study show that 1% of the firms conduct a format safety meeting at the project level biweekly, 9% monthly, 47% occasionally and 43% do not conduct these meetings at all.

Both types of meetings ("tool box" safety talks and safety meetings at the project level) are clear indications of the emphasis that a firm exercises over the importance of safety. Unfortunately, the results reveal that the common practice in the industry is not to conduct these meetings on frequent basis.

#### **Availability of Safety Equipment**

Table 2 shows information related to the availability of safety protection measures at the jobsite (i.e., guardrails, handrails, warning barriers, protective partitions,... etc.), availability of Personal Protective Equipment (PPE) to workers (i.e., hard hats, safety glasses, gloves, face shields,... etc.) and frequency of posting safety signs and posters at the jobsite.

Eight percent of the firms provide safety protection measures always or most of the time. For PPE, 1% and 51% of the firms provide PPE for their workers always and most of the time, respectively. Posting safety signs and posters is exercised by 48% of the firms always or most of the time.

Clearly, the lack of safety protective measures, the lack of PPE and the unavailability of safety signs and posters are contributing factors to poor safety performance. Toole (2002) argues that some construction accidents result because of the absence of safety equipment necessary to perform the job safely at the location of the work. Duncan and Bennett (1991) reviewed the performance of various fall protection systems and concluded that both active measures (those that prevent workers from falling, for example,

guardrails) and passive measures (those that protect workers after falling, for example, safety nets) are useful in reducing fall injuries. Chi et al. (2005) analyzed contributing factors to 621 occupational fatal falls. Significant linkages were found between causes of falls and accident events. Falls are associated with lack of complying scaffolds, unguarded openings, inappropriate protections, removal of protections and improper use of Personal Protective Equipment (PPE). Chi et al. (2005) suggest prevention measures to prevent falls or to mitigate the consequences of falls.

#### **Safety Inspections**

Respondents were asked about the frequency of safety inspections conducted by either the safety supervisor or the project manager. Thirteen percent of the firms conduct these inspections biweekly, 20% monthly and 67% occasionally.

Deficient enforcement of safety is recognized as a major cause of accidents. Safety inspections are the usual means used to enforce safety at the jobsite. The results show that the majority of the participating firms "occasionally" conduct these inspections. The expected direct consequence for low frequency of safety inspections is more safety violations, which result in an increased possibility of accidents. Hinze and Gambatese (2003) indicate that safety inspections are one of the means by which project managers and site supervisors can become acquainted with the nature of the safety conditions on the site. Toole (2002) argues that to effectively enforce safety on the jobsite, the entity must be able to monitor the work on a frequent basis. Wong et al. (1999) argue that safety performance is affected by monitoring of safety compliance. Jaselisks et al. (1996) recommend increasing site safety inspections. Their analysis show that firms with better safety performance conducted more site safety inspections compared with firms of poor safety performance. Hinze and Figone (1988) and Hinze and Talley (1988) showed better safety performances when contractors monitored project safety performance. Hinze and Wilson's (2000) respondents recommend more jobsite visits to improve safety performance.

#### **Safety Incentives and Penalties**

Hinze and Wilson (2000) indicate that incentives have the objective of providing a positive reinforcement

of a desired behavior. Safety incentives are designed to influence worker actions so that safer worker performance is encouraged and rewarded. According to CII (1993), safety incentives are among the top five high-impact zero accident techniques. Hinze and Gambatese (2003) indicate that of the various types of safety initiatives that companies utilize to promote worker safety, the most widely implemented type of program involves safety incentives. To improve safety performance, Jaselisks et al. (1996) recommend

increasing fines to workers with poor safety performance. Tam and Fung (1998) suggest utilizing safety incentives to improve safety performance.

The respondents were asked to indicate whether or not their firms reward (or penalize) their workers for their safe (or unsafe) behavior. 44% of the firms reward their workers for complying with safety instructions. 57% of the firms penalize workers for violating safety instructions.

**Table 4: Factors of poor safety management in the Jordanian construction industry**

<b>Factor</b>	<b>Current status of the industry</b>
Organizational safety policy	34% of the contractors do not have an organizational safety policy.
Safety training	Only 13% of the firms provide formal safety training for most of their workers.
Safety meetings	45% of the firms conduct "tool box" safety talks occasionally.
Safety equipment	47% of the firms conduct safety meetings at the project level occasionally and 43% do not conduct these meetings at all. Only 1% and 7% of the firms provide safety protection measures always and most of the time, respectively.  Only 1% and 51% of the firms provide PPE to their workers always and most of the time, respectively.
Safety inspections	Only 21% and 27% of the firms post safety signs and posters always and most of the time, respectively. 67% of the firms conduct safety inspections occasionally.
Safety incentives and penalties	56% of the firms do not reward workers for their safe behavior.  43% of the firms do not penalize workers for their unsafe behavior.
Workers' attitude towards use of safety equipment	67% of the firms report the hesitance of their workers to make use of safety equipment.
Labor turnover rates	65% of the firms have labor turnover rates higher than 25%.
Compliance with safety legislation	Less than 40% of the firms meet Article 85 of the 1996 Labor Law regarding safety committees and minimum number of safety personnel.

The results show that more than 40% of the firms are not making use of a prescribed technique to improve safety performance. To more effectively promote the safe behavior and discourage the unsafe behavior, more firms in the industry need to make use of safety incentives and safety penalties.

#### **Workers' Attitude towards Safety**

Aksorn and Hadikusumo (2008) indicate that attitude is a tendency to respond positively and/or negatively to certain persons, objects or situations. Individuals are different in their perception of risks and willingness to take risks. Successful safety programs can be achieved if the positive attitudes of employees towards safety are

improved. The authors identify workers' attitude as one of the top five CSF for successful safety programs. Several researchers identify workers' attitudes as one of the root causes of accidents (Abdelhamid and Everett, 2003; Toole, 2002; Hinze, 1981).

Respondents were asked to rate their workers' attitude for using safety equipment. Sixty-seven percent of the firms report the hesitance of their workers to make use of such equipment, 26% indicate quick acceptance and 7% report rejection of their workers to use safety equipment. As such, it is the responsibility of these firms to promote the use of safety equipment to their workers through both positive and negative influence (i.e., safety incentives and penalties).

### **Labor Turnover Rates**

Sixty-five percent of the firms have labor turnover rates higher than 25%. To improve safety performance, Harper and Kohen (1998) recommend reducing labor turnover rates. Hinze and Gambatese (2003) examine the relationship between labor turnover rates and safety record. Hinze and Gambatese (2003) study results show that higher turnover rates are associated with higher injury rates. Firms with 75% of their employees having been with the firm for more than one year have lower median injury rates compared with firms that have less than 75% of their employees for more than one year (Hinze and Gambatese, 2003). Higher turnover means more new hires on the job. Hinze (1997) notes that new hires are more subjected to accidents. Consequently, construction contractors are advised to decrease their labor turnover rates to less than 25% in order to improve their safety performance.

### **Compliance with Safety Legislation**

Table 3 shows that the majority of firms do not meet Article 85 of the 1996 Labor Law requirements in reference to the existence of a safety committee and the minimum number of safety personnel. At best, less than 40% of firms are in compliance with safety regulations. The results are clear indications of both poor enforcement of the legislation and poor obedience by construction contractors.

## **CONCLUSIONS AND RECOMMENDATIONS**

The Jordanian society and economy have suffered human and financial losses as a result of the poor safety record in the construction industry. The purpose of this study is to examine safety management in the Jordanian construction industry. The study collected data from 70 general contractors, who are involved in all types of construction. The study reveals several factors of poor safety management as shown in Table 4.

To improve their safety performance, construction contractors are advised to:

- Have an organizational safety policy for the proper administration of safety;
- Provide formal safety training for their workers;
- Conduct daily "tool box" safety talks;
- Conduct weekly formal safety meetings at the project level;
- Always secure safety protection measures at the jobsite;
- Always provide PPE to their workers;
- Always post safety signs and posters at the jobsite;
- Conduct weekly safety inspections;
- Reward workers for their safe behavior;
- Penalize workers for their unsafe behavior;
- Encourage workers to make use of safety equipment;
- Reduce labor turnover rates to less than 25%; and
- Comply with Article 85 of the 1996 Labor Law that sets the requirements of safety committees and minimum number of safety personnel.

To help improve safety performance in the construction industry in Jordan, the Ministry of Labor, Ministry of Public Works and Housing and OSHI are advised to combine forces and do the following:

- Draft new safety regulations for the administration of safety. Bearing in mind the limitations of the existing regulations, the new ones should be more comprehensive and should particularly target the construction industry;
- Promote safety culture in the construction industry by nationally recognizing the contractor with the best safety performance annually; and
- Consider safety performance as one of the evaluation criteria in public bidding.

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