The International Journal of Construction Management (2007) 41 - 51

PERCEPTION OF CONSTRUCTION MANAGERS TOWARDS SAFETY IN PALESTINE

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Abstract
Throughout the world, construction is one of the most hazardous industries due to the complex and unsafe nature of construction; the Gaza Strip in Palestine is no exception. Construction site safety records on the Gaza strip are considered poor and local contractors, sub-contractors and their workers face daily risks from hazards that need to be managed to prevent death, injury and illness. In view of this, the aim of this paper is to provide insight into the perception of Palestinian construction managers towards: 1) the local industry's characteristics which generally affect construction safety, and 2) the factors that directly or indirectly cause site accidents. In doing so, a relative importance index was developed and used to rank the different common characteristics and factors identified by local managers. The results highlighted the most important industry characteristics that give rise to safety challenges viz.: poor accident record keeping and reporting systems; extensive use of subcontractors; and lack of safety regulations and legislation. The results also indicated that the main factors leading to site accidents are: lack of supervision and control on workers' adherence to wear personal protective equipment, lack of regular safety meetings, and the lack of respect for the few available safety regulations.

Keywords
Palestine, construction, safety, industry characteristics, accidents, regulations.

INTRODUCTION

Construction is one of the most hazardous industries due to the nature of the complex and unsafe construction sites. As site safety records in the Gaza strip are poor, there is an urgent need to improve construction safety. Recent international safety literature suggests that the main factors affecting safety performance include safety awareness by top management, lack of training, poor safety awareness of project managers, reluctance to input resources in safety management, and reckless operations; also the government needs to play a more critical role in ensuring stricter legal enforcement and organizing safety training programs (Tam *et al.* 2004).

The prevention of construction accidents usually entails predicting future accidents and their nature under given circumstances. As making such predictions is based on knowledge about past accidents, clearly, research and prudent safety practices are required to prevent construction accidents. The major causes of such accidents are related to the unique nature of the industry, human behaviour, difficult work-site conditions, and poor safety management, which result in unsafe work methods and procedures (CII 1990).

Compared to other industries, accident rates in construction are high. Thus, construction and project 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 (Hinze 1997).

Details about causes and physical conditions of construction injuries have been insufficient or almost non-existent in Palestine, in particular, and in the Middle East in general. The available information and data on this subject is too generic and does not provide enough guidance so that more effective accident prevention programs can be developed. A poor safety record is one of the most difficult challenges to face the Gaza Strip construction industry over the last few years. The rate of fatalities and injuries in construction is high relative to other industries. According to the report of the Ministry of Labour (2005), 31% of workers who died in the Gaza Strip were construction workers. The report further states that 19.5% of reported injured workers in the Gaza Strip are construction workers.

Safety and health, and the environment, are often neglected on construction sites and are rarely managed in Palestine. In particular, there is a lack of safety rules and legislation. This situation has led to an increase in construction site injuries.

The aim of this paper is to provide insight into the current perception of Palestinian construction managers towards the local industry's characteristics which generally affect construction safety, and the specific factors that might lead to site accidents.

SAFETY IN CONSTRUCTION

Accidents at work occur either due to one of the following reasons: a lack of knowledge or training, a lack of supervision, a lack of the means to carry out the task safely, an error in judgment or carelessness. In addition to these factors, the short term and transitory nature of the construction industry, the lack of a controlled working environment and the complexity and diversity of the size of construction firms, all have an effect on construction projects' safety. In construction projects, unsafe behavior is considered to be the most significant factor in the cause of site accidents and therefore provide evidence of poor safety culture (Coble & Kibert 1994).

Site accidents are more likely to happen when there are inadequate company policies, unsafe practices, poor attitudes of construction personnel, poor management commitment and insufficient safety knowledge and training of workers. Project managers must pay more attention to important factors such as: company safety policy; construction process; personnel management with regard to safety; and incentives (Evelyn *et al.* 2004). Safety management regulation is an effective tool to reduce the site accident rate in the construction industry. Accident reporting programs, safety inspection programs, safety orientation programs, management involvement in safety, large companies, and low levels of subcontracting work made important contributions to reducing accident rates, and consequently need to be included in the proposed safety management system framework (Poon *et al.* 2000).

Ahmed *et al.* (1999) have studied the main problems that adversely affects the implementation of construction site safety in Hong Kong. They found that the most serious problems are tight construction schedules and inefficient communication due to the multi-level subcontracting

system, followed by limited budgets on safety investment and the inability of safety officers to enforce safety regulations. Further, they recommended that, in order to reduce the effects caused by such problems, the minimum contract periods for different categories of construction works be studied to avoid site accidents. Accidents, injuries and property losses not only cause delays, but also directly and indirectly incur costs. The realization of the cost of accidents and human suffering that follows has brought about changes in the attitudes of management and employees with regard to safety (Salminen 1995).

The factors influencing safety on construction sites are historic, economic, psychological, technical, procedural, organizational and environmental. The top five most important issues found to be associated with site safety were: management discussions on safety; the provision of safety booklets; the provision of safety equipment; providing a safe environment and appointing a trained safety representative on site (Sawacha *et al.* 1999). The highest-ranking five characteristics for improving safety were: training and education, communication between managers and employees, and organizational culture. The highest-ranking barriers to safety improvement were: the cost of training employees, the cost of controls, or man-hours to enforce safely use, and the low-bid mindset of both employees and managers. Contractors who reported the use of "hard measures" for safety performance, such as inspections/audits, processes for collecting safety measures, and "near-miss" reporting, achieved significantly better self-reported safety outcome measures (Loushine *et al.* 2004).

Fundamental to construction safety management is hazard identification; unidentified hazards present the most unmanageable risks (Carter & Smith 2003). It appears that an individual's associations between hazards and tasks are based upon their knowledge, experience and training. For this reason, the task-hazard relationships must accurately define the hazards relevant to particular tasks. In turn, such an approach would help safety managers to improve site safety by focusing the organisation's limited resources on implementing control measures to reduce the risks associated with these safety-significant tasks (Carter & Smith 2001). Effective planning for safety is thus essential if projects are to be delivered on time, without cost overruns, and without experiencing accidents or damaging the health of site personnel. The lack of planning leads to project uncertainties such as late changes being realized at the construction stage, along with incurring extra time and monetary costs; and an increase in the likelihood of accidents (Hare 2004).

Unfortunately a significant portion of construction contract money is wasted as a result of insufficient planning, project mismanagement, and poor craftsmanship, and the competitive "low bid" contract award process. Worker attitude and the lack of skilled workers were cited as major barriers to the improvement of quality and safety. In contrast, management commitment/ leadership, communication, audits/observations, strong safety culture/climate, safety program evaluations audit processes, and employee involvement had a positive influence (or outcome) on construction safety performance (Loushine *et al.* 2003).

An effective safety program should cost significantly less than the dollar losses resulting from accidents that otherwise are apt to occur. Improvements in safety management can be accomplished by hiring contractors with a record of good safety performance, or, when the selection is limited, by identifying contractors with mediocre safety performance as targets for owner involvement. Contractors' attitudes toward safety range from minimal compliance to total commitment, so concerned owners should consider and take note of the past safety performance of contractors during the bidding process and when awarding the contract (CII

1990). Throughout the world, occupational injuries at construction sites are identified as a major problem. Falls from a height and falls occurring at the same level were the most commonly presented injuries of workers over 51 years of age. Traffic accidents, however, were the most common cause of occupational injuries among the workers under 30 years of age (Jovanovic *et al.* 2004).

Interestingly, falling from a height appears to be the major cause of construction injuries and fatalities in Kuwait. Poor accident records and reporting systems hide the extent of the construction safety problem there. Additionally, many people at management level are unaware of the accident-related costs and the effectiveness of a safety program in reducing project costs (Kartam & Bouz 1998). In China, the most important construction workplace safety management factors were prioritized as follows: foreman related, worker related, crew related, manager related and safety training related. Such a priority of list key factors can be referred to when limited safety resources are allocated on a construction site to achieve the best workplace safety outcome (Fang *et al.* 2002).

Governments worldwide have maintained an on-going commitment towards establishing a working environment free of injury and diseases. This commitment is reflected by establishing performance-based workplace health and safety legislation. Such legislation sets generalized performance objectives and provides a system of clearly stated responsibilities to encourage greater self-regulation for the construction industry (Mohamed 1999). Management should, therefore, encourage and support safety by exhibiting good safety examples; effectively managing health and safety programs, attending health and safety meetings, performing inspections, investigating near-miss accidents and reviewing safety performance at all levels (Wents 1998). Hinze and Godfrey (2003) stated that managers of construction projects should be encouraged to consider the use of behaviour based worker observations and worker safety perception surveys as valuable measures of safety performance that can assist them in their pursuit of the zero injury objective.

RESEARCH METHODOLOGY

This paper is based on a quantitative approach comprising two parts. The first part is intended to provide insight into the perceptions of Palestinian construction managers towards the local industry's characteristics which affect safety; the second part is concerned with the different factors that directly or indirectly cause site accidents. Based on a combination of a literature review (CII 1990, Hinze 1997, Katram & Bouz 1998, Poon *et al.* 2000, Fang *et al.* 2002, Tam *et al.* 2004, Hare 2004, Evelyn *et al.* 2004), and consultations with key local experts concerning construction safety, a total of thirteen industry characteristics and 30 factors were identified. The local experts were executive construction managers who had more than twenty years experience in managing construction projects.

Extensive use was made of ordinal scale[4] measures for eliciting data on respondents' perceptions. The respondents were asked to rate their agreement or disagreement with the nature of safety problems and safety causes on a five-point Likert scale. Fifty questionnaires were distributed to construction managers who were involved directly in managing construction projects. A total of 42 questionnaires were collected from the randomly selected construction companies at different construction sites in the Gaza strip, a response rate of about 84%. The respondents to the survey were construction managers who had extensive experience in managing construction projects in the Gaza Strip.

To determine the ranking of the different problems facing construction safety and the factors causing construction accidents, the "Relative Importance Index" (RII) was adopted. This method transforms the five-point Likert scale to help determine the ranking of each factor, using the following expression:

$$RII = \frac{\sum_{i=1}^{5} a_i x_i}{5 \times N}$$

Where a_i is a constant expressing the weight of the ith response; x_i is the frequency of the ith response of the total responses for each cause; i is the response category index, where $i = 1, 2, 3, 4$ and 5, respectively, N is the total number of respondents. The RII value ranges between 0 to 1 (Tam *et al.* 2000, cited in Tam *et al.* 2003).

RESULTS AND DISCUSSION

Local industry characteristics

Table 1 shows the Relative Importance Indices and the ranks of each characteristic that are perceived to cause hindrance to safety improvement on Gaza strip construction sites.

Table 1 Relative index and ranks of characteristic that perceived to cause hindrance to safety improvement

Safety characteristic	Low Importance ←				→ High	RII	Rank
	1	2	3	4	5		
Lack of relevant accident data	3	1	3	6	29	0.87	1
Extensive use of subcontractors	4	4	5	9	20	0.78	2
Lack of safety regulations	5	3	8	9	17	0.74	3
Low priority of safety	3	5	8	14	12	0.73	4
Small size of most construction firms	6	5	7	6	18	0.72	5
Competitive tendering	3	7	9	12	11	0.70	6
High labor turnover	7	8	5	4	18	0.69	7
Disorganized labor	9	3	7	11	12	0.67	8
Absence of safety planning	6	8	10	3	15	0.66	9
Low of concerns on safety training	9	8	4	8	13	0.64	10
Absence of contractors safety prequalification	5	8	12	10	7	0.63	11
Poor management practices	7	13	7	11	4	0.56	12
Seasonal employment and weather effect	6	15	10	6	5	0.55	13

A discussion of the results from the survey is presented below, along with the tabulated data (Table 1). *The lack of relevant accident data* was ranked first by respondents, with (RII=0.87). This result indicates the high importance placed on safety data availability by management staff who use it in orientation sessions for their employees. On-site employees appear unaware of safety problems probably because they have not been informed about statistics relating to serious and fatal accidents that have occurred at the sites, as well as the number of disabilities that have resulted from such accidents. Unfortunately, the government, represented by the Ministry of Labour, has few and inaccurate records of safety accidents on construction projects. Hence there is little chance for employees to gain any notion of the impact and numbers of safety problems.

Extensive use of subcontractors was ranked second, with (RII=0.78). Such contractors are considered a real problem in Palestine. The specialization of activities on building sites has

been one of the main factors leading to the extensive employment of subcontractors. Many companies in the Gaza strip look for a secure and fast profit; thus subcontracting projects seems as a safe option in achieving a certain percentage of the profits. This behaviour gives rise to many problems from coordination, safety planning, and allocation of safety responsibilities, to communication. In practice, the effective control of site-safety practices is difficult to enforce when only a small number of subcontractors, especially those with fewer than five employees, are engaged on one site. The main responsibility is consequently taken by the general contractor. To ensure an effective safety plan, the contractor needs to insist that all necessary safety measures are written into the subcontractor's agreement. Unless proper provisions are made for the subcontractors to include safety in their bid, it is doubtful that they will ever take safety on construction sites seriously.

Lack of safety regulations was ranked third, with (RII=0.74). The absence of a unified set of safety regulations adversely affects the enforcement of safety on the job site. International standards are not necessarily applicable to the Gaza Strip work environment since methods and practices in advanced and developed countries differ significantly from those used locally. *Low priority of safety* was ranked fourth with (RII=0.73). As the main concern of a contractor is how to save money and reduce costs, safety is usually considered a secondary priority. Safety is seen as a waste of money by most contractors who appear to be unaware of the effectiveness of safety prevention programs in reducing costs and increasing productivity.

Small size of most construction firms was ranked fifth, with (RII=0.72). The absence of strict regulations in the Gaza strip has encouraged many citizens to establish small businesses. As a result, small construction firms with less than 10 employees account for about 80% of construction firms in the Gaza strip. This high proportion of small undertakings is a hindrance to the spread and adoption of safe working practices. In comparison to large firms, the small firms are usually short of capital and under great pressure to cut costs at the expense of safety. Saving a few dollars might mean the difference between them making a profit or a loss. In addition, most small firms use temporary labour and thus continuity of work is not assured. Consequently, investing money in training or safety equipment for the employees is considered an unnecessary cost.

Competitive tendering was ranked sixth, with (RII=0.70). In recent years, the relatively low number of available construction projects has made the practice of competitive tendering between small contracting firms fighting for business survival even tougher. As a result, contractors have been forced to reduce their profits and costs to stay in the market. It is apparent that contractors in the main believe their bids will be considered even if they do not make proper provisions for safety costs. Accordingly most contractors do not consider safety costs in their tenders unless it is a component of the contract documents.

High labor turnover was ranked seventh, with (RII=0.69). The construction industry has a particularly high labor turnover when compared with other industries. This is partly due to the mobility of construction workers who may be engaged on several geographically dispersed sites in any one year partly due to the short duration of most jobs. High labor turnover in any job is not conducive to a good safety and health record. On many sites, training/orientation programs for new entrants and the identification of job hazards do not exist; therefore, employees are required to learn from their experience and mistakes.

Disorganized labor was ranked eighth, with (RII=0.67). Currently, there is no effective

union or institution to defend local labour's employment rights. Labour unions in developed countries are powerful and can pressurize contractors, for example, to provide safe working conditions and safety equipment to ensure the protection of their workers' rights and health. This is not the case in Palestine where workers are not aware of their basic rights to safe working conditions.

Absence of safety planning was ranked ninth, with (RII=0.66). With detailed work planning, all materials and equipment necessary to perform each task safely would be on hand when required. The extra effort such as stress, strain and anxiety required to perform any given task in a safe way would be reduced. Indeed, it is expected that the workers would choose safe methods more often if planning formed part of the process. Thus safety planning should be regarded as an integral part of project scheduling so that hazard-prevention requirements can be addressed before dangerous circumstances arise and costly interruptions occur.

Low concerns on safety training was ranked tenth, with (RII=0.64). This result indicates that there is a lack of professional safety training. Safety training must be tailored to tackle the specific problem areas and safety situations which the company experiences. Training materials need to cover, in detail, the costs of accidents, and the influence of good safety performance with an emphasis on the safety objectives of the company, relevant laws and legislation, and the contractual relationships with clients on safety matters. A formal training program would help personnel to carry out various preventive activities effectively as well as establish a positive attitude towards safety, and its integration into production and quality goals.

Absence of contractors' safety prequalification was ranked eleventh, with (RII=0.63). Thus it appears that a better way to ensure construction managers take safety seriously is for clients to weigh previous safety performance as a significant factor in awarding contracts. *Poor management practices* concerning observing safety rules and regulations was ranked twelfth, with (RII=0.56). Both research and practical experience indicate that the role of top management is crucially important for achieving appropriate results in safety performance. Indeed, unsafe conditions and accidents are usually a sign that something is wrong in the management system itself. *Seasonal employment and weather effect* was ranked thirteenth, with (RII=0.55). Weather condition, such as extreme temperatures during the summer season, often adversely affects worker's state of mind and attention.

Factors contributing to site accidents

The respondents identified three different groups of factors: management-related, worker-related, and project-related factors. The Relative Importance Indices and the ranking of these three groups of factors, as postulated by the respondents are shown in Table 2.

Management-related factors

This group of factors was ranked high by the respondents, with six of the top ten factors causing accidents. The lack of supervision and control on worker's adherence to wearing safety items was considered the top cause (from 30 factors) of accidents with (RII=0.92). Contractors were seen as weak on strictly enforcing safety issues and requirements at construction sites.

They rated lack of periodical safety meetings, the contractor's non-compliance of governmental safety regulations, the non-assignment of a safety supervisor/officer, and the lack of training programs available to workers as very important factors in the occurring of accidents on construction sites. To satisfy the general duty of safety training, employers in the construction

Table 2 The ranking of factors contributing to site accidents

	Accidents Factors	Highly Disagree (lowest effect) 1	Disagree 2	Neutral 3	Agree 4	Highly Disagree highest effect 5	RII	Overall Rank
Management Related Factors	Appropriate personal safety procedures were not specified	3	7	9	12	11	0.70	13
	Correct tools were not used for the specific task	4	4	5	9	20	0.78	8
	Lack of supervision and control on workers adherence to wear safety items	0	1	1	11	29	0.92	1
	Safety regulations were not followed	1	2	0	17	22	0.87	4
	No safety engineer at site	3	0	3	19	18	0.85	5
	Safety items were not available on site	7	8	5	4	18	0.69	14
	The management is pushing work regardless of laborers abilities	9	8	4	8	13	0.64	17
	No or lack of weekly safety meeting	1	1	0	15	25	0.90	2
	No training program for worker to implement the job	0	2	8	19	13	0.79	7
	No written/known procedure for the assigned job is available.	3	8	11	1	19	0.72	11
	Lake of appreciation after completion of the task	7	7	5	12	11	0.66	16
Worker Related Factors	The worker was suffering from health problems	16	12	4	9	1	0.44	30
	The worker was not in an acceptable physical condition	17	9	2	3	11	0.51	28
	Physical fatigue caused the accident	14	10	5	4	9	0.52	26
	The worker was suffering from mental fatigue on the job	13	8	3	1	17	0.60	23
	Worker was rushing the work	5	3	8	9	17	0.74	10
	The accident occurred due to misjudgment from the worker	3	8	18	5	8	0.63	18
	The worker had no satisfaction with the nature of the job	17	2	8	5	10	0.55	25
	The worker had not enough sleeping hours	15	2	14	7	4	0.52	26
	Worker was not wearing personal protective equipment	3	2	3	1	33	0.88	3
	Workers working long hours	11	6	7	3	15	0.62	21
	The worker was overconfident	2	20	3	12	5	0.59	24
	Lack of knowledge by worker on wearing personal safety items	13	3	7	3	16	0.63	18
	The worker was delaying the accomplishment of the orders	2	15	7	12	6	0.62	21
Job or Project Related	No cohesiveness among job crew	5	0	1	21	15	0.80	6
	Not enough rest time during the task	8	7	5	5	17	0.68	15
	Weather conditions were extreme	21	2	9	7	3	0.45	29
	The social and political life in Gaza strip is uncomfortable to the worker	1	4	8	19	10	0.76	9
	Unsuitable living, housing and transportation facilities for the worker	8	5	1	12	16	0.71	12
	Job or task was too difficult to perform	5	8	12	10	7	0.63	18

industry see the need to provide training at several levels (from a basic introduction level addressing safety for everyone on the site to safety training courses for managerial staff). Safety should, therefore, form a part of the overall training program for construction activities. Furthermore safety meetings should be used as a vehicle to: review the effectiveness of project safety efforts; resolve current health and safety problems; provide a forum for planning safe construction activities; plan ahead for new or changed operations; and update and enhance the accident prevention program.

Worker-related factors

This group of factors was ranked lower by the survey respondents. The two highly ranked factors are: the worker was wearing personal protection, and the worker was rushing the job. Such factors could be related to workers' low level of safety awareness and their work culture. It appears that most of the workers were either illiterate or had only basic reading and writing skills. They need to become more aware that wearing protective clothing and the use of safety tools are crucial in reducing the number as well as impact of accidents.

Project-related factors

The respondents ranked the project-related factors low. Only two high ranked factors can be attributed to causing accidents: the lack of cohesiveness among the job crew; and the social and political life in the Gaza strip, and Palestine generally. The first factor was a bit of surprise as there are no workers who come from other countries or cultures or speak different languages when compared with the situation in neighboring countries. The second factor causes the workers to feel uncomfortable and insecure. This is a very important cause of accidents as there is a strong relationship between stress and accidents. Further, a large number of projects are implemented in areas close to the border between Palestine and Israel; this area is described as very tense and dangerous. For example, workers are fearful of the Israeli military; there is the constant threat of being shot at any time. This situation puts the workers under pressure to complete the work as soon as possible which increased accidents among workers who did not concentrate on what they were doing.

CONCLUSION

A survey of local construction managers was conducted in the Gaza strip to identify the common industry characteristics which affect safety, and the different factors that directly or indirectly cause site accidents. The results indicate that many characteristics of how the industry operates are detrimental to working safely. These include: poor accident record keeping and reporting systems; the extensive use of subcontractors; the lack of safety regulations and legislation; the low priority given to safety; the small size of most construction firms; and the competitive tendering process. Unfortunately, the Ministry of Labour has few accurate records of accidents; and so there is no precise way of knowing what the real root causes of construction accidents are in Gaza. Further, local subcontractors are not very interested in safety issues, and thus it is essential that proper provision of safety requirements is included in any bids.

The top ten factors attributed to the number of site accidents were mainly management-related. Six factors were included in the management group; two factors related to the workers, and two factors are related to the nature of the job. The survey showed that the top factors are as follows. The top ten most important factors that affect construction safety are: lack of supervision and control over worker's adherence to wearing personal protection equipment

protective clothing; lack of regular safety meetings; safety regulations that were not followed; the lack of having a safety supervisor/officer at site; the lack of cohesiveness among the job crew; the lack of a training program for the workers to help them implement safety procedures on the job; incorrect tools were used for a specific task; the social and political life in Gaza strip creates stress and anxiety; and the worker rushes the job at hand. These factors should be considered as important elements in any company safety program. Such a program should be used as a means for overcoming construction safety problems in the Gaza strip.

It is recommended that, safety records and evaluation systems be considered as a pre-requisite to improving safety programs. The local government and the contractors are counselled to keep accurate and up-to date records of all construction accidents to help identify the size and root causes of the problem. Also, subcontractors should be encouraged to take safety issues into consideration when bidding for a new job. Positive changes to safety management in the Gaza strip will aid in the avoidance of minimization of accidents.

As the competitive bidding process provides an opportunity for contractors to cut safety budget items in order to win the job, it is advisable to rethink the whole approach of choosing contractors on the lowest bidder principle. Employers also need to provide training courses especially for new workers, to increase their awareness of safety issues. Additionally, some form of appropriate legislation, along with effective enforcement mechanism will help to improve the overall occupational health and safety in the local construction industry.

[4] An ordinal scale is a ranking or rating of data that normally uses integers in ascending or descending order.

ACKNOWLEDGEMENT

The first author (A. Enshassi) would like to express his thanks and gratitude to the support of the Alexander von Humboldt Foundation in Germany.

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