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# Construction safety in Kuwait: issues, procedures, problems, and recommendations

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## Abstract

The building construction industry plays a major role in the economy of the state of Kuwait. This paper evaluates existing safety regulations, describes safety procedures adopted by owners, designers, contractors and insurance companies, and assesses the suitability of these regulations and procedures for Kuwait's environment and workforce. It also discusses problems associated with enforcing safety regulations at construction sites. Furthermore, the study identifies the role played by different construction parties in safety programs and policies, taking into consideration cost and time effectiveness. Management in government, owners, and contractors are all aware of the importance of safety in construction, but do not actively pursue effective ways to maximize the achievement of the safety goal. It was observed that the problems arise due to: (1) disorganized labor; (2) poor accident record keeping and reporting system; (3) extensive use of foreign labors; (4) extensive use of subcontractors; (5) lack of safety regulations and legislation; (6) the low priority given to safety; (7) the small size of most construction firms; (8) competitive tendering; and (9) severe weather conditions during summer. © 2000 Elsevier Science Ltd. All rights reserved.

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## 1. Introduction

Research on risk management perceptions and trends in US construction shows that safety is considered to be one of the highest risk allocations, and is marked at 8.3 on a 10 point scale (Kangari, 1995). By assigning safety the highest importance rating, contractors believe that they have and will continue to have sole responsibility for this risk in the future.

Safety standards and regulations are published by international and national organizations and are accepted by the construction industry. Among these are the

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Occupational Safety and Health Administration (OSHA) standards for the construction industry, the US Department of Energy safety regulations, and US Army Corps of Engineers safety and health requirement manual. Kuwait Oil Company (KOC) safety standards and Ministry of Public Works (MPW) safety chapter in the construction practice manual are other major sources of safety regulations adopted in Kuwait.

Gun (1993) investigated contractors' safety performances at 98 different construction sites over 2 years. It was concluded that management training and good management practices are most likely to prevent injuries which are associated with the violation of regulations. Hinze and Raboud (1988) studied safety on large construction projects; the study discussed the relationships between company size, level safety policy, project level safety policy, project coordination, and economic pressure on worker safety. It was found that higher frequencies of construction accidents occurred on projects that were over budget and those that were competitively bid.

According to a Business Round Table report (Construction Industry Institute, 1988), the cost of an effective construction safety and health program in the USA is approximately 2.5% of direct labor costs. Successful safety programs have been developed by many construction companies and have shown remarkable results. Dupont's safety training and observation program achieved good results in reducing work-place accidents (Peyton and Rubio, 1991). Bechtel reported that 83% of their projects are meeting the zero goal after applying the 'Zero Accident Program'; this program reduced lost-time injuries in 1993 to less than half when compared with 1992 (Center to Protect Workers' Rights, 1993).

Hakkinen (1995), developed a training program called "one hour for safety management" to provide safety education and training for top management. The program was applied in 100 companies and showed success in attracting management's attention to safety issues. Ringdahl (1990) designed a simple model for cost-benefit evaluation of improving safety measures at companies. Jaselskis et al. (1996) presented strategies for improving safety performance on both a company and a project level.

This paper presents a field and a regional study of safety in the construction industry, which is one of the major sectors of the Kuwaiti economy. Safety legislation and plans should parallel industrial developments to alert a new generation to the importance of safety. The study aims to:

1. evaluate the existing safety procedures, regulations, policies, and accident prevention methods related to the construction industry in Kuwait;
2. understand the safety problems and danger of injuries that occur in concrete building construction in Kuwait;
3. identify the roots of construction safety problems in Kuwait;
4. recommend potential solutions and safety programs, estimating their likely effect on accident reduction and project progress; and
5. develop strategies that make safety an integral part of the individuals and a characteristic of any competitive company.

## **2. Research methodology**

Different research activities have been used to collect the necessary information and data related to this research. Among these are field visits, questionnaires, and interviews.

### *2.1. Contractor's questionnaire*

To understand the problems associated with the implementation of safety programs in construction companies, questionnaires were mailed to technical managers, safety directors, and in some cases chief engineers. Key persons in companies were identified either by business contacts or by direct phone calls to the companies. Thirty-two questionnaires were mailed to various large, medium, and small-sized construction companies in Kuwait. The questionnaire covered a range of subjects related to safety, namely: (1) company's profile; (2) safety records; (3) accident statistics; (4) training; and (e) safety policy.

### *2.2. Consultant's questionnaire*

Another study was conducted to determine the extent to which designers recognize the need to address the safety of construction workers in project plans, contractors' selection criteria, contract clauses concerning safety, and procedures followed at job site supervision. Addresses of key consultants were identified from a bulletin distributed by the Kuwait Engineering Society.

### *2.3. Interviews*

A number of interviews were conducted with safety engineers, heads of safety departments in government ministries, and company superintendents. The interviews stressed the difficulties in implementing safety at job sites, government procedures and policies, safety standards, cause of most construction accidents, and methods of prevention. Interviews with contractor's superintendents covered safety programs, labor behavior and company's investment in safety.

Visits were also made to two major insurance companies dealing with construction insurance in Kuwait. The questions covered insurance types, premiums, major accidents, companies' commitment to safety procedures at the job site, labor compensation, accident records, accident investigation procedures, and insurance companies' role in safety in general.

## **3. Regulations, procedures and safety policies in Kuwait: analysis and critique**

Existing safety procedures and policies by government, insurance companies and construction firms have been studied to evaluate their suitability for the Kuwaiti work environment.

### 3.1. Government

To learn about safety rules, interviews were conducted with safety engineers and persons in charge of decision-making at Kuwait Municipality (KM). Every contractor is required to contact the Safety Department of the KM when starting a new project and submit necessary documents such as building permit, area location, etc. 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 an 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.

KM's Safety Department hires safety engineers and inspectors who conduct daily site inspections at construction projects throughout Kuwait. Inspections include safety procedures and equipment provided by the company, in addition to site cleaning and proper disposal of construction materials. A printed form of the safety checklist which contains major possible safety violations is used by KM safety inspectors. This form contains 29 items and is divided into three major sections: (1) safety procedures at the job site; (2) storage permits; and (3) traffic and road permits. Firms who commit a violation are penalized by either a warning ticket or a penalty ticket based on the type of violation. The penalties for each violation range from a few dinars (1 KD≈\$3.27) to a few thousand. Table 1 summarizes KM safety violations and tickets in each governorate from 1992 to 1995. It can be seen that despite thousands of safety violations committed at construction sites and thousands of safety warnings issued by KM, only about 100 safety tickets are given annually, indicating loose enforcement policy.

Table 1  
Total construction safety violation and warnings by Kuwait Municipality (1992–1995)

Year		Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1992	Warnings	Monthly data is not available												1168
	Tickets													40
1993	Warnings	151	100	84	83	84	92	86	96	125	202	29	298	1430
	Tickets	0	3	1	0	1	2	3	0	2	3	7	15	37
1994	Warnings	305	172	260	329	260	519	333	252	333	272	367	334	3736
	Tickets	16	0	27	9	27	10	6	3	11	1	19	9	150
1995	Warnings	324	130	265	328	162	245	177	206	266	295	264	253	2915
	Tickets	5	4	4	7	9	1	5	9	19	10	18	14	105

The Safety Department at KM deals directly with accidents at projects under construction. KM is notified of the accident by the police department, which is where the accident should be reported and recorded first. After a notification is received, a safety engineer from the department visits the site, conducts an investigation, and questions witnesses and the injured person, if possible. Also, he investigates the safety procedures followed by the company when the accident occurred, and writes his report on site conditions and cause of the reported accident. After that, the Municipality sends the report to the police station and later on to the insurance company. Sometimes KM is notified late of the accident, resulting in poor and incomplete records.

### 3.2. Contractors

All contractors in Kuwait are divided into four major ranks depending on their size — as per the Central Tendering Committee governmental classification (Central Tendering Committee, 1998) — where Rank 1 designates the largest contractors and Rank 4 designates the smallest. To better understand a contractor's safety strategy, a simple questionnaire was designed and distributed to technical managers, chief engineers, and safety engineers in different construction companies. This questionnaire was followed up by direct interviews with key managers in these companies to gain an insight into their safety procedures and safety costs. Questionnaires were sent to the largest companies in the market of Ranks 1 and 2, in addition to some small and intermediate firms of Ranks 3 and 4. Thirty-two questionnaires were distributed, but only nine replies were received, i.e. 28% response rate. This poor response can be attributed to one or both of the following reasons: (1) safety receives low priority; and (2) questionnaires, in general, have a low response rate, especially in the construction industry where, in the heat of managing projects, top management has no time to answer survey questions. Table 2 shows that most of the respondent companies are of Ranks 1 and 2, reflecting an awareness of safety importance in the largest companies in Kuwait. The number of serious accidents and claim costs of accidents are used as a measuring tool of safety performance; however, it is used with caution because of incomplete and unanswered questions by some companies. These companies believe that safety information, especially that related to claims and costs, is confidential and may negatively affect their reputation. The questionnaire is divided into the following four parts as shown in Table 2:

1. *Profile and size of the company*: through our investigation, it has been found that Rank 1 companies with higher construction project values experienced fewer accidents and claims (Kartam and Bouz, 1998). This indicates that large-scale business and continuous work allow the company to invest more money in safety and pay more attention to safety issues. However, Table 2 shows that one of the large companies experienced 30 claims in the last 3 years but paid only a small amount of money for labor compensation. This may be related to the company's implementation of good safety procedures on site and/or that

Table 2  
Contractors questionnaire replies<sup>a</sup>

	Rank 1			Rank 2				Rank 4	
	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7	Company 8	Company 9
<i>Company profile</i>									
1 - Annual volume of construction (million KD)	95–115	4–12	4–10	2.5–9	1.5–7.5	2–2.5	0.5–1.5	0.75–3	0.65–0.8
2 - Company construction category									
a - Building construction (%)	60	30	90	100	80	80	100	100	90
b - Heavy construction (%)	5	60	–	–	20	–	–	–	–
c - Industrial construction (%)	10	5	–	–	–	–	–	–	–
d - Others (%)	25	5	10	–	–	20	–	–	10
3 - Site craft size	2500–4100	500	200–500	45–450	90–900	150–300	60–120	60–100	120–140
4 - Subcontractors work (%)	30	40	70	70	30	50	35	50	30
5 - Workers not on company's bail (%)	15	25	10	0	20	60	35	90	10
<i>Safety records</i>									
1 - Record keeping:									
a - Accident frequency rate	Yes	Yes	No	No	No	Yes	Yes	No	Yes
b - Lost time injury	Yes	No	No	No	No	Yes	Yes	No	Yes
c - No. of minor injury	Yes	No	Yes	No	Yes	Yes	Yes	No	No
d - No. of reportable injury	Yes	Yes	Yes	No	No	Yes	Yes	No	No
e - No. of fatalities	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
f - No. of dangerous occurrence	Yes	No	No	No	Yes	Yes	Yes	No	No
2 - Record summarized by:									
a - Entire company	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes
b - Project	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
c - project manager	Yes	Yes	No	No	No	No	No	No	No
How often? (monthly, annually)	Monthly	Monthly	Monthly	Monthly	Annually	Annually	Monthly	Annually	Monthly

Table 2 (continued)

	Rank 1			Rank 2				Rank 4	
	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7	Company 8	Company 9
3 - Cost of accidents summarized by:									
a - Entire company	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes
b - Project	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
c - Project manager	Yes	No	No	No	No	No	No	No	No
How often? (monthly, annually)	Monthly	Monthly	Monthly	None	Annually	Annually	Monthly	None	Monthly
4 - No. of claims experienced in the last 10 years	N.A	30	16	30	12	20	N.A	4	10
5 - Cost of claims in the last 10 years (KD)	N.A	1600	1000	20000	25000	30000	N.A	27000	10000
6 - No. of serious accidents experienced	3	N.A	N.A	4	1	2	N.A	2	N.A
7 - Safety manual	Yes	No	No	No	No	No	No	No	Yes
<i>Safety policy and program</i>									
1 - Safety program	Yes	No	Yes	Yes	No	No	No	Yes	Partly
2 - Percentage of safety expenditure	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
3 - Safety coordinators and engineers	10	2	6	3	None	3	4	5	None
4 - Safety training (Yes, No)	Yes	No	No	No	No	Partially	No	No	No
5 - Safety meeting:									
a - Weekly	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
b - Monthly	Yes	No	Yes	No	Yes	No	No	No	No
6 - Safety equipment & cloths (Yes, No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7 - Safety instructions at job site	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

(Table continued on next page)

Table 2 (continued)

	Rank 1			Rank 2				Rank 4	
	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6	Company 7	Company 8	Company 9
<i>Management role</i>									
1 - Consider safety procedures cost in contract?	No	Yes	No	No	No	Yes	No	Yes	Yes
If yes, what percentage?	–	0.1	–	–	–	2	–	2	N.A
2 - Consider safety in staff appraisal?	Yes	Yes	Yes	No	No	Yes	Yes	N.A	Yes
3 - Safety procedures increase cost of construction:									
a - Hardly	No	No	No	No	No	No	No	No	No
b - Quite a bit	Yes	No	No	Yes	No	Yes	No	No	Yes
c - Substantially	No	Yes	Yes	No	No	No	Yes	Yes	No
4 - Cost of safety regulations to total project value (%)	1.5	N.A	0.12–0.26	1.16–1.2	0.1–0.25	1.6	0.5	1.7–2	N.A

<sup>a</sup> N.A., no answer; KD, Kuwati ainar.

the accident was attributed to the worker's fault. Companies with a high number of workers experienced a lower number of accidents, while companies with excessive use of subcontractors had more accidents (Companies 4, 6, 8) and paid more for claims (Table 2).

2. *Safety records and manual*: Table 2 shows that most respondent companies do not have a safety manual on site or in the head office, except for one firm which has a good safety record and the least number of accidents (Company 1). The number of reported accidents and fatalities are recorded by construction companies and mainly summarized by each project
3. *Company's safety policy and program*: about half of the respondents claimed that they have a safety program at the company's level; however, they did not attach a copy of it with their reply as was requested, except for one firm which had a two-page program. All companies claimed that they provide personal protective equipment (PPE), keep safety instructions on site, and have equipment registered and kept in safe conditions. On the other hand, no safety training is provided for staff and new workers.
4. *Management policy and safety cost*: many managers think that safety procedures substantially increase the cost of construction. This may explain the 'no answer' reply to the safety expenditures requested in the questionnaire. Accident costs and safety procedures are not considered in the contractor's bid and only the insurance cost is considered for those items. Accident costs are kept for the entire company by most firms; however, firms with annual recording of accident costs experienced more accidents and claims (Companies 5, 6, 8). Managers estimate the cost of implementing safety procedures and regulations to be 0.25–2% of total project value. In summary, Table 2 illustrates that larger companies, measured in terms of annual billing, have better safety performance and fewer accidents than smaller companies.

### 3.3. Insurance

Insurance companies in Kuwait are insured through international insurance organizations; policy and premiums are derived from international premiums. Insurance companies provide several types of insurance for construction businesses, including construction accidents on site, equipment damage, third party, and others. Insurance of construction work is approximately 1.75% of total project value. Premiums are calculated according to project type, size, location, and expected dangerous conditions (i.e. marine work is different than high-rise building or villa). The contractor's previous safety records are not requested by the insurance company, and if needed are taken orally.

Insurance officers do not have a safety manual to follow and do not conduct site visits to client projects to check procedures on site. Premiums are increased for construction companies with bad safety records; however, this cannot be traced if the contractor decides to insure with another company since no sharing of information exists between the insurance companies.

### 3.4. *Owners and consultants*

Safety requirements are always stated in the contract documents. Owners and consultants do stress safety before work commences, but as the work progresses their concern for deadlines becomes a priority and they tend to pay less attention to safety. Some owners request a safety officer at the job site in contract documents, especially for large-scale projects. In contrast, many construction management offices and government authorities do not request past safety records from the contractor in their prequalification process.

As the largest independent governmental company in Kuwait's oil industry, KOC has many construction projects including roads, buildings, and electrical–mechanical works. KOC has its own safety standards for different job descriptions. KOC requires a safety program to be submitted in the tendering stage and considers this program in its total evaluation of the contractor's bid. In addition, safety engineers are hired to conduct site inspections and control safety performance at the company's projects.

## 4. **Safety problems in Kuwait**

Construction sites tend to have several employers working on them simultaneously, making safety coordination in such a dynamic environment a very complex process. Temporary duration of work, together with the rapidly changing character of the site are in complete contrast to regular factory production and form a serious hazard to safety. Kuwait's construction industry has many special features that adversely affect the safety of its workers. These special features and problems arise from the following:

### 4.1. *Competitive tendering*

Contractors often feel that their bids will be considered even if they do not make proper provisions for safety costs. In the case of hard-pressed local authorities, struggling with government-imposed spending cuts, and smaller firms on the brink of survival in a business recession, this problem is usually more acute and seldom comes to the surface. These problems affected Kuwait after the liberation, due to expenditure cuts and a large number of small construction firms. The extent of cost cuts by government and the low number of governmental projects have increased the competitive tendering between companies in the last 5 years. As a result, contractors have been forced to reduce their profits and costs to stay in the market and allow projects to sell to other companies or subcontractors to secure a profit margin.

As shown earlier in the questionnaire distributed to construction firms, most contractors do not consider safety costs in their tenders unless it is recognized by the contract documents. Statistics show that lost-time accident frequency rates, which ranged from 2.5 to 6 per 100,000 man-hours worked on contracts where no provision for safety costs been made in tenders, could be reduced to a range of

0.2 to 1 per 100,000 man-hours worked on projects where proper safety planning and costing had been done and the costs accepted by the client (King and Hudson, 1985).

#### *4.2. Lack of safety regulations*

The absence of a unified set of safety regulations adversely affects the enforcement of safety on the job site. The MPW has a safety chapter in its construction practices manual, KOC has its own manual, and no safety standard manual exists in KM. Projects constructed by American companies are ruled by OSHA and/or the US Army Corps of Engineers safety manual. International standards are not necessarily applicable to the Kuwaiti work environment since methods of practice in advanced and industrial countries differ from those used in Kuwait. Other national standards have not been updated to comply with the new technology and constructability methods; for example, the prohibition against using wooden scaffolding is not included in such standards.

#### *4.3. Small size of most construction firms*

The open trade and commercial lease given to its citizens by the Kuwaiti government encourages many citizens to establish small businesses, which are especially concentrated in construction. Small construction firms with less than 10 employees account for about 60% of construction firms in Kuwait. This high proportion of small undertakings is a handicap to the spread and adoption of safe working practices.

After the liberation, private housing businesses flourished, attracting many small firms and independent contractors with limited experience in building construction. These firms cannot afford the services of safety specialists or instructors, resulting in little opportunity for organized safety instructions either off- or on-site. Compared to large firms, the small firms are usually short of capital and under great pressure to cut costs at the expense of safety. Construction at this level is a competitive arena, where the saving of a few dinars means the difference between success and failure. In addition, most small firms use temporary labor and may not assure continuity of work, so investing money in training and equipment for them is considered an unnecessary cost. Also, it is more difficult for government safety inspectors to inspect the work and practices of a large number of small firms than a smaller number of medium-sized and large ones.

#### *4.4. Extensive use of subcontractors*

The specialization of activities on building sites has been a main factor leading to the extensive employment of subcontractors. Many companies in Kuwait look for safe and fast profit, selling their projects to subcontractors for a certain percentage of the profit. This causes many problems in coordination, safety planning, allocating safety responsibility, and communication.

In practice the effective control of site-safety practices is difficult to enforce when a number of small subcontractors, especially those with fewer than five employees, are engaged on one site. The main responsibility is taken by the general contractor, who should insist that all necessary safety measures are written into the subcontractor's agreement. Unless proper provision is allowed for the subcontractors to consider safety in their bid, it is doubtful whether they will take safety seriously.

#### *4.5. Lack of relevant accident data*

If you cannot measure safety, then you certainly cannot manage it. The lack of official safety data and records of construction accidents at sites makes safety the last issue to be concerned by the contractor and owner. The people on-site and at management level are not aware of safety problems, since they are not informed by the statistics or figs. of serious and fatal accidents that have occurred at sites, and the number of disabilities that resulted from such accidents.

#### *4.6. Extensive use of foreign labor*

Kuwait as a rich developing country attracts many investments and working labor. The employment of migrant labor has always been a special characteristic of construction sites in Kuwait. Different labor cultures and traditions reflect on human relations, different work habits, and communication problems. Most construction workers in Kuwait are unskilled, untrained, and inexperienced, especially after the liberation. They come from poor communities of other countries and are ready to work in any job to establish a reasonable life for their families; many do not see their families for 2–3 years in order to save some money for the future. The workers are emotionally vulnerable and preoccupied with their problems since most of them are working in unsecured conditions and not on their sponsor's bail. All of these above conditions can affect the concentration and attention of the worker and may contribute to mistakes.

#### *4.7. Disorganized labor*

The construction industry in Kuwait depends mainly on a foreign labor force that has no union or community to defend its rights and secure its work. In contrast, labor unions in industrial countries are powerful and can pressure contractors to provide safe working conditions and safety equipment to protect their workforces' rights and health. Hence, workers are not aware of their rights to safe working conditions. In Kuwait, labor groups feel alone with no organization to defend them and they have to accept the company's policies and rules.

#### *4.8. High labor turnover*

Construction has a particularly high labor turnover when compared with other industries. This is partly due to the mobility required of construction workers, who

may be engaged on several widely separated sites in any 1 year, and partly to the short duration of most jobs. High labor turnover in any job is not conducive to a good safety and health record. Previous research shows that more than 50% of construction accidents are caused by worker turnover and ignoring safety regulations (Yu, 1990). On many sites, training/orientation programs for new entrants and identification of job hazards do not exist; therefore, employees are required to learn from their own experience and mistakes.

#### *4.9. Low priority of safety*

The main concern of a contractor is how to save money and reduce costs. Safety is usually considered a secondary priority in the company's plans. Safety is considered a waste of money by most contractors since they may be unaware of the effectiveness of safety prevention programs in reducing costs and increasing productivity.

#### *4.10. Seasonal employment and weather effect*

Apart from direct construction accidents in Kuwait, hazards arise from extreme weather conditions in summer, when temperature is usually greater than 110°F, often adversely affecting the worker's state of mind and attention (Oglesby et al., 1989). Many contractors tend to work long hours during good weather to make up for the time lost due to bad weather. A previous study shows that accidents occur two-and-a-half-times more often while working long hours (King and Hudson, 1985).

#### *4.11. Other problems*

Several safety inspection authorities are set up to serve the same purpose under different ministries, thus dissipating limited funds and resources and leading to more confusion due to inconsistency in their regulations and/or the extent of enforcement. In addition, several wrong construction practices are still in use, such as:

1. Wooden scaffolding without proper guard rails or toe boards.
2. Deep trenches excavated manually with vertical sides; also, excavated soil is piled beside the trench, increasing the risk of collapse.
3. General dearth of PPE of all kinds; mostly only supervisory workers are provided with even the most common PPE, such as hard hats.

### **5. Recommendations for safe construction**

#### *5.1. Government*

As discussed earlier, safety departments in different ministries work independently and do not share information with each other. In addition, the present

reporting system collects information about an injury's circumstances, but the hazard that caused it and the safeguards needed to keep it from happening again are not mentioned. A general reorganization of injury reporting must be undertaken so that hazards and hazard-prevention data will be uniform throughout all governmental agencies, workers' compensation programs, and insurance companies.

Current governmental safety inspection programs are ineffective because the inspectors are limited both in their number and qualifications. It would be better for a competent person with appropriate credentials and certification to make an independent review of a construction project and its safety plan and to sign off on it before work commences. This competent person would review the project quarterly to see if the plan is implemented and write a report for construction management. Such a proactive, rather than reactive, approach to safety planning and control has proven to be more effective and economical (Kartam, 1997).

The currently used codes should be carefully reexamined to determine if different codes would be more appropriate and to establish Kuwaiti safety standards to be used consistently by all construction parties. Such revisions of most frequently used codes are necessary due to the following reasons:

1. technological: comprising new hazards (asbestos), new methods of dealing with old hazards, and improved knowledge;
2. administrative: including changes in the size and nature of management responsibilities, work force, and contractors; and
3. social: concerning people's increased expectations and safety awareness.

With respect to project safety, contract specifications need to establish specific guidelines to control all anticipated hazards by:

1. naming the person who will be responsible for overseeing the contractor's performance;
2. requiring all contractors to prepare and submit an acceptable project hazard prevention plan that defines supervisory and employee safety training;
3. identifying specific published safety standards and hazard prevention requirements; and
4. listing qualifying requirements for eligible contractors to ensure that bidders are restricted to those whose past performance shows that they are careful, competent, and safe contractors.

The following government role practices can be used to improve safety at construction sites:

1. requiring construction safety planning for both design and construction;
2. developing a safety information bank of construction accidents and prevention methods;

3. shifting the function of preliminary and routine construction safety audits or inspections to competent safety engineers; and
4. using government fines from unsafe sites to fund a safety information highway.

## 5.2. Contractor

### 5.2.1. Accident reporting

Knowing about past accidents is critical for top managers who want to reduce future accidents in their companies. Therefore, accident reports should be routed through appropriate management, reviewed, and then channeled back for corrective action. After completing the corrective action, a program of follow-up is needed to evaluate the effectiveness of the corrective action taken.

### 5.2.2. Safety planning

If detailed work planning was carried out, all materials and equipment necessary to perform each task safely would be on hand when required. The extra effort required to perform any given task in a safe way would be reduced and workers would choose safe methods more often. In addition, the extensive use of sub-contractors has caused a need for centralized construction safety planning, in which the work of all parties is coordinated to avoid hazardous circumstances.

Safety planning should utilize the critical path method as a part of project scheduling so that hazard-prevention requirements can be addressed before dangerous circumstances arise and costly interruptions occur (Kartam, 1997). A good example is the delivery of heavy items that must be lifted by a crane. If delivery is scheduled when the items can be directly unloaded into place, then redundant and dangerous handling, storage, and transport can be avoided.

### 5.2.3. Safety training

Safety training must be tailored to tackle the specific problem areas and safety situations which the company experiences. Training material should discuss the costs of accidents, the influence of good safety performance, and should stress the safety objectives of the company, the relevant laws and legislation, and contractual relationships with clients on safety matters. There is a growing need for new education and training strategies focusing on top management based on internal control, human factors, safety management, and safety culture rather than earlier emphasis on external control, enforcement, and technical inspections (Hakkinen, 1995). A formal training program helps personnel to carry out various preventive activities effectively. It also helps establish a positive attitude towards safety and integrates safety into the production and quality goals.

### 5.2.4. Management practices

Both research and practical experience indicate that the role of top management is crucially important for achieving results in safety (Oglesby et al., 1989). Unsafe conditions and accidents are usually a sign that something is wrong in the management system itself. The following measures by managers were shown to be effective

in reducing accidents and improving safety performance (Levitt and Parker, 1976; Koehn, Kothari and Pan, 1995):

1. Accept personal responsibility for improving safety, and eliminating and correcting unsafe working methods or conditions.
2. Communicate and show a real concern for safety.
3. Utilize a self-inspection program.
4. Allocate as many of the costs of accidents as possible to the projects on which those accidents occur.
5. Assign the costs of accident prevention programs to a company safety account.
6. Utilize an active surveillance program to collect and disseminate information about the accident rates in each project.
7. Evaluate field managers for salary increases or promotions in terms of accident records.
8. Talk about safety in the same manner as about cost and schedule.
9. Adopt a cost-reporting system that reflects the cost of accidents in weekly or monthly cost reports.
10. Provide training for newly-hired workers, stressing safe work methods and job hazards.
11. Use incentives with caution.

### 5.3. *Insurance*

Insurance is a poor long-term investment when compared to an investment in eliminating or controlling hazards that diminish the need for insurance. Insurance is the most costly method of trying to control loss caused by hazards, since it provides no method to fund their prevention. Insurance rates should be based not on past losses that are calculated in retrospective rating plans, but on the savings that can be generated when safeguards and measures are used to reduce the damages from hazards that have caused injury, demise, and property loss.

Insurance companies can reduce insurance costs as much as 80–90% (MacCollum, 1995) if they adopt the following recommendations:

1. Insurance companies should compile data from their claims records on the hazards that cause injury and death so these data can be shared with the insured.
2. Insurance companies should require that specific hazard-prevention measures be in place before coverage is granted to contractors.
3. Workers' compensation insurance should no longer provide immunity to an insured who deliberately fails to provide available, recognized safeguards.
4. Large construction projects should have the option of a self-insured program. By carrying its own insurance, construction management could penalize contractors who fail to meet the requirements of the safety plan; such penalties should always be higher than they would have been if the contractor had provided the necessary safeguards in the first place. The biggest benefit of self-insurance is that the true costs of losses become very obvious and it is easy to pinpoint the project and perhaps individuals who should be held

accountable. Construction managers suddenly have a great deal of incentive to prevent losses and to better manage losses when they do occur.

We need to move from risk management to hazard identification and prevention. If we do that, we will have fewer risks to manage without costly insurance.

#### 5.4. Owner

Owners play an important role in reducing construction costs and rates of accident occurrence. Traditionally, owners have often considered themselves in a less vulnerable legal position if they do not involve themselves in a contractor's safety program, and protect themselves by the 'hold harmless' clause in most contracts in Kuwait. The hands-off policy is no longer adequate in today's legal climate; construction accidents can have serious legal effects for owners in several major ways.

##### 5.4.1. *Proposed contractors' prequalification and safety performance evaluation*

We cannot conceive of a better way to get construction company managers to take safety seriously than for clients to weigh previous safety performance as a significant factor in awarding contracts. In Kuwait, data similar to the Experience Modification Rating and OSHA incident rates are not available due to the absence of specialized safety organizations and statistics, in addition to contractors' negligence and unawareness of safety importance. However, an owner can prequalify contractors and evaluate the contractors' safety performance based on the following:

1. Who in the company receives and reviews accident reports and how often.
2. Frequency of safety meetings for field supervisors.
3. Accident records subtotaled by superintendent or foreman.
4. Frequency of safety project inspections.
5. Accident cost system measurement used.
6. Past safety performance.
7. Key supervisory safety person.
8. Safety program of the company.
9. Safety documentation.
10. Subcontractors' policy.
11. Management, supervision, work activities, training, motivation and communication.
12. Plant equipment and maintenance.
13. PPE.

Also, there is no substitute for visiting a current construction project of each candidate on the list to see if the work actually is being conducted safely.

##### 5.4.2. *Safe owner practices*

The owner has a legal duty to provide instructions and orientation to the contractor. The following techniques can be used by the owner to improve the contractor's safety performance:

1. Use a work permit system for potentially hazardous activities to regulate the job risks.
2. Stress safety during the prebid stage.
3. Incorporate specific safety requirements in specifications.
4. Conduct periodic inspections and maintenance of safety records.
5. Consider safety as a criteria in awarding contracts.
6. Develop in-house owner construction safety personnel with expertise.
7. Discuss safety at job meetings.
8. Require contractors to delegate safety to on-site personnel.
9. Allow a safety margin to be considered in competitive bidding for awarding contracts.
10. Reward safe contractors for good performance.

### 5.5. *Designer and consultant*

Through a questionnaire distributed to designers, it was found that 70% of the respondents did not address construction worker safety and health in their designs (Department of Energy, 1993). Experience shows that the safety of construction workers cannot be guaranteed by legislation alone. Designers can play a strong role in reducing the incidence of injuries and fatalities; designers should accept this responsibility with a heartfelt commitment to provide in each design a safer work place for the construction workers.

The design of many traditional projects takes place with little regard for the problems to be resolved during construction. Designers must be made aware of the various means by which their design decisions impact the job-site safety conditions for construction workers. Specifications should be adequate and thoroughly describe the installation procedure and standards. Non-hazardous materials should be used as often as possible. The designers' understanding of the causes of site accidents will help to focus their attention on construction details which may be potentially dangerous. Since a substantial number of fatalities and injuries result from falls, it is important that designers should reduce to the absolute minimum the need for men to work at height.

An example of unsafe conditions caused by designers is a construction project where the gap between the basement walls surrounding the plot area and the shoring is 50–70 cm, which should be insulated and covered by blocks from outside. This situation creates a difficulty in material delivery to the work area and an inability of masons to move freely, especially when the wall height ranges from 5 to 6 m.

Examples of improving the design for the safety of construction workers are:

1. Design higher parapets on all roof edges.
2. Group the roof and floor penetrations, so the number of openings can be kept to a minimum.
3. Locate valves and fittings at safe and convenient locations, where possible.

4. Avoid overhead power lines at the work site by relocating them (possibly underground).
5. Avoid deep excavations.

Fig. 1 shows proposed safety events and plans that should be practiced by designers and consultants throughout the project life cycle in an attempt to eliminate hazards and control safety at the job site (Telford, 1992).

#### *5.6. Workers and site supervisors*

It is imperative that new workers are properly orientated to their job environment because they are usually most vulnerable to accidents on job sites due to unfamiliarity with potential hazards and problems of a construction project that is new to them. Statistics show that workers who have been on the job one month or less account for 25% of all construction accidents (Kjellen and Sklet, 1995).

Part of the responsibility lies with supervisors and site engineers. They should conduct a waste-disposal program weekly or daily, secure specific access and safe roads at the job site, and post warning and hazard signs. Workers, in turn, should obey these procedures and follow the site instructions. Victims of fatal accidents generally worked without the control of a foreman. Maintenance and inspection schedules often are not followed, and only after a breakdown is the equipment repaired.

### **6. Discussion and conclusions**

Increased number of workers, together with the current stagnation in living standards, generally suggest that there are no real grounds for immediate improvements in construction safety in the State of Kuwait. Such improvements may be achieved by better safety organization, proactive safety planning, management commitment, and individual-labor behavior.

Workers' attitudes and site work conditions appear to have a great effect on the implementation of safety measures at the job site. Workers and engineers receive almost no safety training and are mostly uninformed about the company's safety programs or policies, if any at all. Compensations for labor are mostly paid by the insurance company, thus creating a feeling of irresponsibility for site and project engineers and managers. Insurance companies practice little inspection of the contractors' safety procedures on-site or investigate their past safety and accident records. Many contract specifications do not address specific safety requirements, resulting in contractors not incorporating any cost for the implementation of safety procedures/measures in their bids. Competitive bidding and owners' negligence in including the cost of safety in tenders all adversely affect the safety performance of many contractors.

Owners are ultimately responsible for the safety aspect of the construction project and should actively participate in contractors' safety enhancement programs. Safety

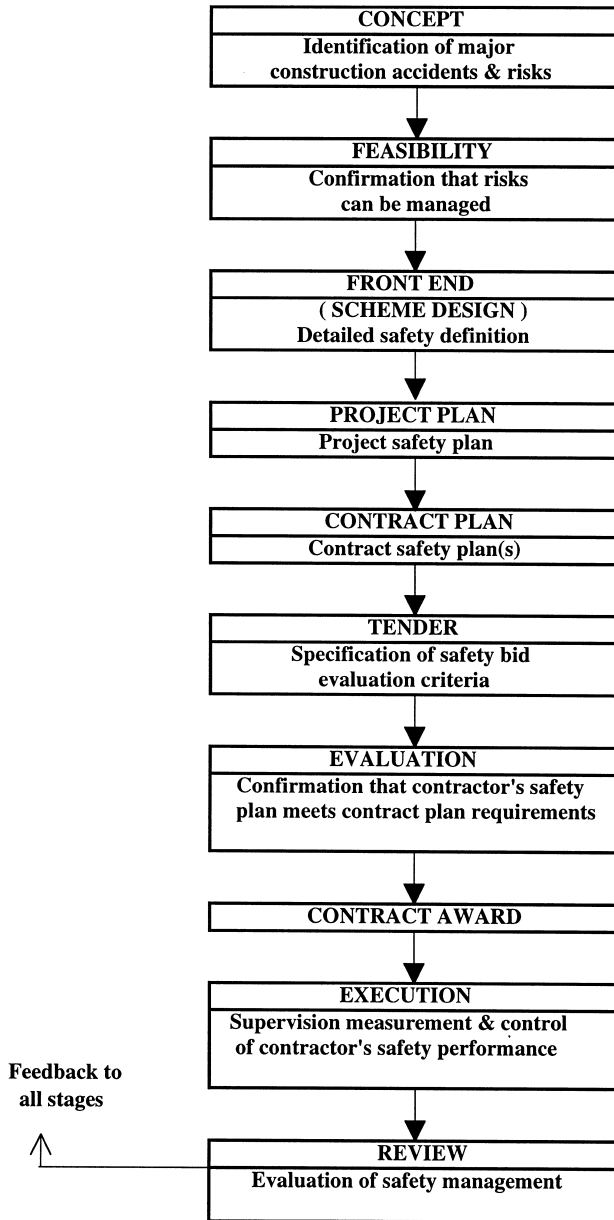


Fig. 1. Safety plans during the project life cycle.

specifications and budgets should be itematically written into the contract documents and should receive the full support of the owners, since it is in their names that the tender documents are issued, and on their property, all that activities occur. Designers must pay more attention to safety factors and ensure that the project can

be constructed and maintained safely. The management of construction firms must also establish and enforce safety policies for employees. A safety recording and evaluation systems are a pre-requisite to an improved safety program, and construction firms should be required to identify potential accident costs, and likely safety benefits. Auditing of safety programs should also be conducted annually. A well-designed safety recording system will enable owners and government authorities to track the past safety experiences of all contractors, and thus be in a position to avoid involvement with unsafe contractors.

Workers' participation in safety programs should be a job requirement, especially since they are the ones who are exposed to the danger of daily job hazards. Training should be provided especially for the new workers, and PPE should be provided to all site staff. More safety coordination among subcontractors is also needed, especially for large projects. Safety planning should be practiced from the early stages of project scheduling and planning and should be reviewed regularly as construction work progresses. Workers must be educated about safety regulations and procedures, and should be trained for safe working methods. Only properly trained workers should be allowed to perform risky tasks, especially when using powered tools and equipment. Management should require the work force to act safely and in accordance with hazard-prevention methods.

Safety could be better managed by a centralized safety center that acts as a liaison between the different safety departments in the State of Kuwait. The main purposes of such a proposed center are to develop and establish unified safety standards; create a construction accident data bank; provide training, technical safety consultation, and inspections; and to require the implementation of the lasted methods of accident prevention at construction sites. Current safety regulations should be improved to permit strict implementation of safety procedures at construction sites and to incorporate a safety cost margin for the contractors in the tenders.

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