

## **Developing and Implementing an Occupational Health and Safety Program in a Construction Company: A Case Study in Pakistan**

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### **Abstract**

Occupational Health and Safety (OH&S) has been an intrinsic area of attention in the construction industries of developed economies. Considerable work to improve OH&S performance in construction has been done globally. However, the developing countries like Pakistan have yet to respond to recent technological as well as OH&S improvements. Research carried out in the subject area of OH&S in Pakistani construction industry show that the majority of the contracting firms in Pakistan have yet to establish a safety program. Accidents and fatalities are sadly common due to a lack of awareness amongst the workers and management. Unavailability of a regulatory framework depicts the unsafe performance on construction companies. On some projects owners and consultants do stress implementation of OH&S, but as the work progresses their concerns for deadlines become a priority rather than the OH&S of the contractor company. This research work attempts to foster concepts of OH&S amongst the management and workers in a construction company with the objective of developing and implementing a safety program and identifying areas of improvements. The key findings of the research advocates for an OH&S program to be implemented by companies working in the construction industry of Pakistan. Insights and discussions are given in this paper.

### **Keywords**

Construction sites, Developing countries, Occupational Health & Safety, Pakistan.

### **1. Introduction**

Safety is one of the primary concerns of any construction industry. Although the construction industry is both economically and socially important, it is recognized as the most hazardous (Suazo and Jaselskis, 1993). A majority of construction deaths results from falls and transportation accidents (38% and 24%,

respectively, in 2007), according to U.S. Bureau of Labor Statistics (BLS, 2008). Considerable research indicates that construction has the highest rate of accidents among industries (Koehn *et al.*, 1995; Sawacha *et al.*, 1999; Ahmed *et al.*, 2000; Choudhry and Fang, 2008). Nevertheless, while the actual incidence rate of construction worker injuries has declined over the past three decades, the number of injuries and fatalities is still at an unacceptable level (Hinze, 1997).

Construction processes in developing countries share similar characteristics in terms of the adoption of technology, construction methods, cultural environments, and regulations (Kheni *et al.*, 2010). Also construction in developing countries such as Pakistan and India is more labor intensive compared to the developed areas of the globe, involving 2.5 to 10 times as many workers per activity (Ahmed *et al.*, 2009). This argument is supported by the statistics gathered by the Pakistan Labor Force Survey (2001) which shows that 3.6% of workers suffered from occupational injuries/diseases (United Nations, 2011), depicting the number of fatalities due to non adoption of mechanization. Accidents along with injuries or related damage, results in additional costs and adversely affects the reputation of a construction company. According to the Pakistan Association of Population Statistics (2000), 4% of deaths happen as a result of accident/injuries. Researchers describe that major causes of accidents are related to the unique nature of industry, human behavior, difficult work site conditions and poor safety management, which result in unsafe work methods, equipment and procedures (Abdelhamid and Everett, 2000).

Research conducted in the developed economies on OH&S is focusing on factors that increase OH&S performance (Kheni *et al.*, 2010). Safety climate, culture and behavior based safety, are some of the important OH&S management strategies (Choudhry, R.M. *et al.*, 2007; Qian and Ruoyu, 2011). However, research carried out in the developing countries is depicting shortfalls of OH&S administration (Suazo and Jaselskis, 1993; LaDou, 2003; Kheni *et al.*, 2010).

## **2. Pakistani Construction Industry and OH&S Practices**

The construction and engineering service sector is one of the most neglected sectors within Pakistan (Ali, 2006). The Pakistan construction industry contribution towards GDP has been varying from 3 – 5 % in the last decade (Board of Investment, 2011). The labor force employed in the construction industry is about 6.6% (FBS, 2009).

Research carried out recently indicates that most companies have an average fatality rate per project in the range of 2-5% of the total project work force (Ahmed *et al.*, 2009). This depicts an alarming condition of occupational health and safety. The low literacy rate among the workforce can also be identified as one of the main causes for the poor health and safety status in Pakistan (Ali, 2006). On some projects owners and consultants do stress OH&S performance by contractor but as the project progresses, the priorities are shifted towards deadlines rather than an effective safety management system. Kheni *et al.* (2010) carried out a similar research in Ghana, which is also a developing country. He revealed that effective institutional structure and an enabling socioeconomic environment are needed to enhance the OH&S performance of SMEs.

Table 1 show that a majority of companies, 92.4%, are medium to small. They are executing many projects. They are hired as main contractors on small projects while on larger projects they work as the subcontractor of a large construction company. These companies have limited resources in terms of finance, machinery and workers, and in general, are not interested in investing in safety.

The main law governing occupational health and safety is the Factories Act of 1934. The Hazardous Occupation Rules of 1978 regulate certain occupations as hazardous, and contain special provisions to regulate the working conditions in those occupations (Awan, 2001). Unfortunately, construction has never been added to such laws or provisions. Other laws dealing with OH&S are: 1)The Mines Act 1923; 2) Workmen's Compensation Act 1923; 3) Dock Labourer Act 1934; 4) Social Security Ordinance 1965;

and 5) Shop and Establishment Ordinance 1969. The health and safety measures prescribed in most of the above laws have not kept pace with the rapidly changing times, conditions or industry requirements. These laws urgently require revision and updating (Awan, 2001; Ali, 2006). Unfortunately, Pakistan's construction industry suffers from poor safety and health conditions. The framework of the existing occupational and health regulations is fragmented and inadequately enforced, making construction sites more hazardous. It appears that regulations are outdated and irrelevant in day-to-day construction operations.

**Table 1: Financial Limit of Companies against Category**

Category	No. of Companies Registered	Financial Limit (In million PKR)	% Companies
CA	128	No Limit	0.5%
CB	101	Up to 2000	0.4%
C1	317	Up to 1000	1.1%
C2	478	Up to 500	1.7%
C3	1080	Up to 250	3.9%
C4	1690	Up to 100	6.1%
C5	3366	Up to 30	12.1%
C6	20660	Up to 15	74.2%

### 3. Problem Statement and Objectives

The majority of the contracting firms in Pakistan do not have an established mechanism for documenting their safety programs (Ahmed *et al.*, 2009). Research carried out to measure the safety performance of construction companies working in Pakistan indicates that 58% of companies lie in the range of extremely unsafe to moderately unsafe (Farooqui *et al.*, 2007). Researchers indicated that emphasis in both developing and developed countries need to be placed on training and the utilization of comprehensive safety programs (Koehn *et al.*, 1995). Formal assessments have identified major reasons for safety non-performance in Pakistan's construction industry which include: worker cooperation and behavior, familiarity and expertise with safety management techniques, safety awareness and knowledge, owner commitment and a safety regulatory framework (Ahmed *et al.*, 2009). The benefits obtained from an effective safety program are much more than the cost of the safety program itself. It also improves productivity and company reputation towards clients (Samelson and Levitt, 1982). Keeping in view of this evidence, the company was encouraged to establish and implement an OH&S program on one of its projects.

Although the research carried out in the subject area has holistically assessed the situation of OH&S in Pakistan's construction industry, a specific project of a company and its safety program has not been evaluated. This case study is an effort to share the experience of implementing a safety program in a construction company operating in Pakistan. The contracting company under consideration is hereby called as "the company". Specifically the objectives of the study are:

- To develop and implement a safety program in a construction company for assuming a leadership role in the area of OH&S;
- To communicate the importance of OH&S amongst management and workers of the company;
- To monitor and resolve problems in the implementation of the safety program; and
- To promote the application of OH&S programs by highlighting the results and to demonstrate its benefits.

## **4. Research Methodology**

The company is classified in C-4 Category by the Pakistan Engineering Council and, was established in 1995. It is currently operating in the Construction and Exploration & Production sector for Oil and Gas in Pakistan. Having its head office in Lahore, it employees over 800 employees all over Pakistan. The company endeavors to develop a formal safety management system to ensure safe construction sites along with continual improvement in occupational health and safety. Acknowledging the importance of safety, the top management of the company keeps it on the top of their priorities.

Literature review was carried out to develop the “*Safety and Health for All*” program. Various strategies were studied from academic journals and published material on the subject area of OH&S. Researchers were involved in the development of this program along with the CEO and General Manager (Projects) of the company, who contributed valuable inputs. The existing safety records and practices were reviewed by the researchers. The program was implemented and monitored for a six month period on a construction site. The scope of the project comprised of the laying of a natural gas pipeline, thus covering civil, mechanical and electrical and instrumentation works. The project took into account hazardous categories of work including work at height, lifting operations, work in confined spaces, and work involving electrical hazards. The researchers resided full time on site during the implementation of the safety program on the project.

Methods of carrying out each activity were carefully designed. This includes preparation of job hazard analysis (JHA) study before executing any task. JHA, also synonymous to Job Safety Analysis (JSA), is a method which helps identify task-related hazards for accident/incident prevention (Chao and Henshaw, 2002). This task was assigned to a team comprising of the Project Manager, HSE (health safety and environment) Manager, Planning Engineer and concerned supervisor/engineer. Prior to initiating an activity, tool box talks were carried out to explain the method of carrying out that activity along with any associated risks. Throughout the course of the project, this method was adopted to carry out all tasks. Safe and unsafe behaviors of workers were observed and reported to the management and HSE officer. All violations/events related to OH&S were documented by the HSE department.

The “*Safety and Health for All*” program was designed to be evaluated by quantitative methods and by analyzing the effectiveness of the program. The data collection was carried out by: 1) comparison of safety costs with benefits earned from the program; 2) The fatality/disabling injury record after implementation of the program; and 3) recording the violations observed during the implementation of the program.

## **5. Safety and Health for All Program**

According to Hinze, (1997) the core elements of a safety program are: 1) Safety Philosophy; 2) Safety Policy; 3) Safety Budget; 4) Safety Team; and 5) Safety Performance Evaluation. These steps were followed in order to develop the safety program for the company. The detail of each element is given below.

### **5.1 Safety Philosophy**

The safety philosophy of the company was designed by keeping in view the following:

- To value the life of those directly/indirectly involved with the company during their operations;
- To claim to be the safest category contractor amongst the C-4 listed companies; and
- To be able to compete in bidding for owners requiring OH&S compliance.

## 5.2 Safety Policy

The OH&S Policy statement set by the company and published in the company's profile states: "Occupational health & safety concerns are integral to its businesses of manufacturing and construction management activities". This policy was well adopted and communicated to the management, supervisors and work force executing the project. It was posted on site offices and on a safety board, on which safety statistics were updated monthly.

## 5.3 Safety Budget

Pertinent importance was paid, when considering and deciding the safety budget for the program. Initially 2% of project cost was decided to be the investment in safety for estimation purposes. Nevertheless, it was subject to change as per requirements. The budget for safety included the salaries of HSE personnel, administrative costs, documentation, first aid medicines, setting up a site clinic with basic medical facilities, ambulance, all types of PPE's, fire extinguishers, sign boards and incentives to promote the OH&S program effectively.

## 5.4 Safety Team

For effective implementation of "*Safety and Health for All*" program, a well organized safety team comprising of the following members was employed full-time (see Table 2):

**Table 2: The Safety Team**

Designation	Nos. Employed	Qualification/Experience
HSE Manager	1	10 years international experience.
Field Medical Officer	1	MBBS Doctor, 5 years experience.
HSE Officer	3	2 to 5 years experience.
First Aid Assistant	1	3 years experience.
Fire Watchmen	2	1 year experience.
HSE Helpers	3	Trained in this program, hired from labor, responsible for housekeeping and assisting HSE Officers.

## 5.5 Scope of the Safety Program

The scope of the "*Safety and Health for All*" program was limited to the following aspects: 1) JHA to be documented for each activity, full compliance of JHA to be monitored, in case of non-compliance a warning to violator and concerned supervisor be issued; 2) Personal protective equipment (PPE) mandatory for all supervisors, management and workers at all times except in site offices. Job specific PPE's were to be used as required in JHA.

## 5.6 Safety Performance Evaluation

The loss or injury of trained and experienced workers, and the worker disruption to progress of work, undeniably represent a reduction in the performance of OH&S (Choudhry and Fang, 2008). Performance evaluation of this pioneering program in OH&S for this company was of strategic importance. It was decided to maintain proper documentation of HSE related activities and events. Performance evaluation was then carried out on the basis of collected data. Analysis and results are given next.

## 6. Research Findings and Analysis

### 6.1 Comparison of Safety Costs with Benefits

It is pertinent to mention that a majority of contractors in Pakistan's construction industry are not eager to invest in safety. However, the research findings (see Figure 1) of the case study show that only a meager 2.1% of total project cost was invested in safety.

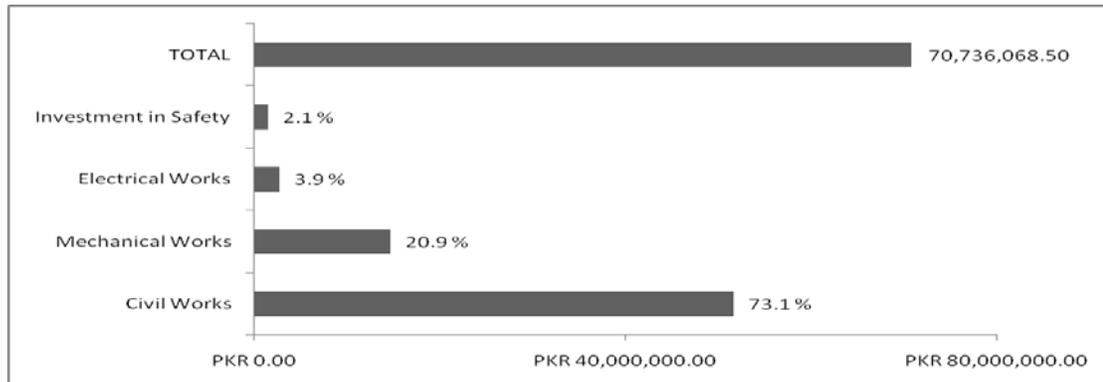


Figure 1 Breakdown of Project Costs

The total Project cost was PKR 70,736,069/- while the cost for implementing safety program was PKR 1,520,500/- (2.1%) of total cost. The benefits earned from this safety program cannot be expressed quantitatively however; the benefits are enlisted as follows:

- Pioneering OH&S in a C-4 contracting company within the company;
- No fatality during the execution of the project;
- Company was able to generate a large profit from the project despite the investment in safety;
- Increase in the probability to win bids from owners selling OH&S implementation;
- Award of another contract worth double the amount of the study project by the same owner.

### 6.2 Safety Performance after Implementation of the Program

The construction industry of Pakistan is known for poor data and record keeping. Interestingly, the company involved in this research did not possess a safety record, from which a comparison could be made and the effectiveness of this program could be tested. However, a comparative method is adopted which was found useful when comparing the safety program effectiveness. This method is known as the safety pyramid (see Figure 2). The safety pyramid is a tool, which indicates in descending order, the number of fatalities, medical treatment, first aid treatment cases, and near misses. The safety pyramid shows that there were no fatalities on the project, this indicates that the “*Safety and Health for All*” program performed well.

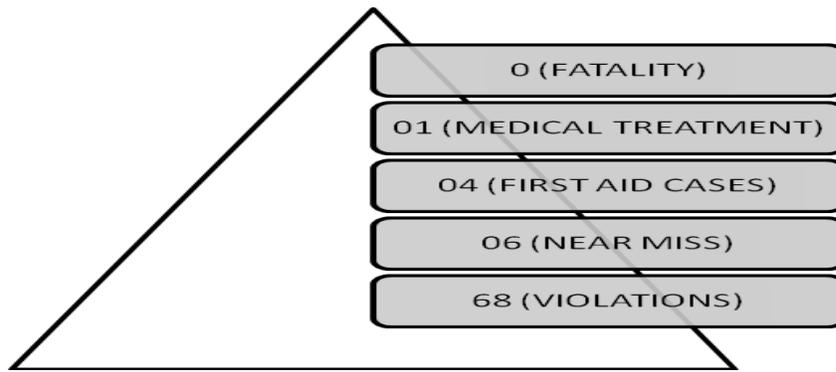


Figure 2 Safety Pyramid

### 6.3 Safety Violations during the Program

The majority of work quantum of the project was civil works. Violations committed by workers while executing civil works were about 51% of all violations as shown in Figure 3. It is not surprising to note that mechanical works had 37% of violations, less than civil works. A total of 68 violations were observed, the majority of which were reported by the HSE officers, about 83%, a few by management 12%, and only 5% were reported by the foremen and workers. A linear relation between the work quantum of a specific trade with the number of violations was found. Furthermore, a reason that does not support the above statement is that majority of the workers involved in civil works are laborers, which are generally illiterate and negligence results in unsafe behaviors. The crafts people for mechanical and electrical trade attended vocational trainings and were seen to adopt to OH&S requirements more easily as compared to the civil works laborers. This may be analyzed in future research work, assessing trade wise safety behaviors and their violation rate.

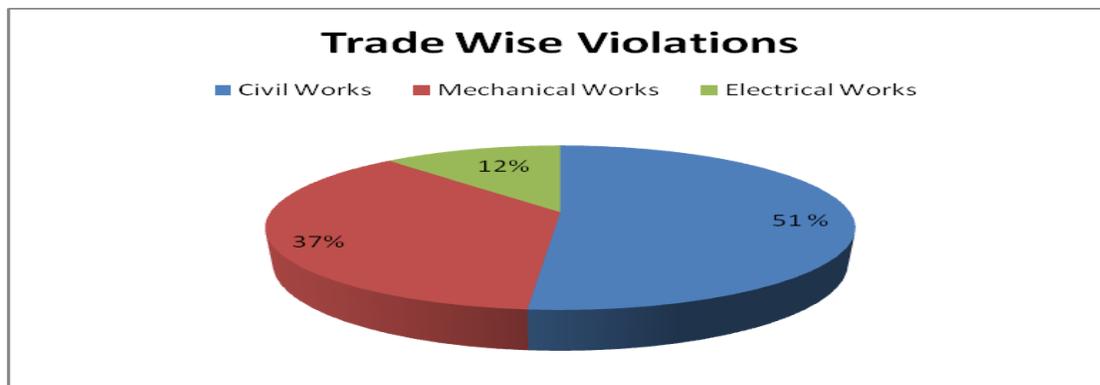


Figure 3 Trade Wise Violations

## 7. Conclusion

The research brought a close look of the implementation of a successful “*Safety and Health for All*” program of the company. The findings of the study includes that the manpower employed on the project varied throughout the project duration from a minimum strength of 18 workers initially to a maximum of 250 workers on the project, during its execution phase. The total numbers of man-hours were 253,176. Success of the program is indicated by the fact that there were no fatalities or disabling injuries.

The study utilized a ‘safety pyramid’ method to measure construction safety performance. The safety pyramid of this project shows in descending order, the number of fatalities, number of injuries resulting in disability, first aid cases, and near-misses which provides useful knowledge for managing safety.

Nonetheless, the research was limited to a medium sized company having limited resources, covering many aspects of a single project. Further research is planned to target a larger company; subsequently analyzing safety performance on multiple projects.

Through this research work, the company has now exercised the importance of safety implementation and remains committed to continual improvement. An OH&S database is created by the company to enhance the knowledge from a project-to-project basis, and on identifying hazards and unsafe conditions and acts. The findings of this study advocate that other contractors working in the construction industry should implement OH&S on their projects which would make the construction site a safer place to work.

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