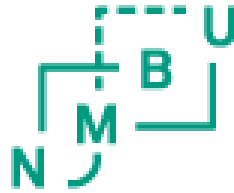




**Health, safety and Environmental conditions at Housing construction sites
in Lahore city, Pakistan**



**A thesis submitted in partial fulfilment of the requirements for the degree of Master in
International Environmental Studies**

By

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August, 2015

Dedication

I dedicate this research work to my wife and daughter

Declaration

I, Muhammad Rizwan hereby declare that this thesis titled;

“Health, safety and Environmental conditions at Housing construction sites in Lahore city, Pakistan” is a result of my own research findings and investigation. This work has not been previously printed, published and submitted in any university or research institute.

Signature:



Date: 18/08/2015

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List of Abbreviations

HSE	Health ,Safety and Environment
ILO	International Labour organisation
GoP	Government of Pakistan
OHS	Occupational Health and Safety
PPE	_Personal Protective Equipment
CIWCE	Centre for Improvement of Working Conditions and Environment
LDA	Lahore Development Authority
OSHA	Occupational safety and health administration

Abstract:

The construction industry is an important section of the economy and is generally considered as a driver of economic growth in many countries. It also provides opportunities for employment for diverse sections of society. Regardless of its importance, construction industry is considered as hazardous with frequent accidents to workers. Nevertheless, knowledge and awareness on how health, safety and environmental issues are managed on Pakistani construction sites is limited. This paper therefore, intends to look at the current practices of Health, safety and environmental risk assessment, management communication and control in Pakistani context. In pursuing this objective, multiple strategies (Pilot interviews, Questionnaire survey and Case study) were used whereby six pilot interviews were conducted with senior management staff of five construction companies, about 100 questionnaires was distributed (15 site managers, 5 owners, 8 contractors, 5 sub-contractors and 67 site workers) for questionnaire survey through purposive sampling to determine the health, safety and environmental measures currently applied on construction sites and lastly one housing construction site was selected in Lahore city as a case study.

The findings from pilot interviews indicated that majority of the respondents have a poor degree of risk awareness and don't seem to take health, safety and environment as a major issue. The results of questionnaires survey show that the majority of causalities are fall from heights, electric shocks, stuck in between the plants, struck by an object or machinery. Similarly there was a lack of HSE management plan, inadequate first aid facilities, lack of personal protective equipments and lack of accident reporting mechanism. The results from case study show that all the responsibility on risk management was with the construction manager. There was no systematic method for risk assessment, but rather hazards were assessed based on individual judgement directed by experience and educational background. In the meantime, hazard information were spread through safety meetings and controlled by Personal protective equipment.

1. Introduction:

Health, safety and environment (HSE) is relevant to all fields of industry but it is specifically important for the construction industry. It has always been a critical issue as it is considered as among the most hazardous sectors when it comes to occupational accidents. Although much progress has been made in HSE performance in developed countries, the construction industry still lag behind in most of other countries. As a matter of fact construction industry continually has injury/fatality statistics that make it one of the most vulnerable industries in which to work especially in poor countries. Several researches for example (Hinze, 2002; Vredenburg, 2002) have demonstrated that HSE improvements will only be accomplished if workers/employers change their behaviours and incentive schemes are implemented to motivate them. It is obvious that these attempts are not really enough to control the incidents of hazardous acts on construction sites. Consequently, restraining occupational injuries/fatalities/illness should be main concern for all workers and employers in any country.

The construction industry has got the recognition of being a highly risky industry because of the high rate of accidents and fatalities that happen on construction sites around the world (Smallwood et al., 2008). Likewise Sohail (1999) also describes construction industry as very hazardous. Globally, construction workers have two to three times more probability to die on the worksite than workers in other occupations whereas the risk of critical accident is about three times higher. HSE is an important humanitarian concern that needs proper control. One of the biggest challenges facing this industry is that HSE comes at a cost. Construction managers presume that implementation of HSE measures on construction sites will lead to higher cost, and thus lower profitability. Nevertheless, it has been established that investment in construction HSE in fact increases the profitability by increasing productivity, increasing workers morale and reducing attrition (Mohammad, 2003)

On the other hand, as the world has increasingly shrunk through technological advancements; the case of the construction worker's health and safety has become a real problem and poses a concern i.e. shared globally. Though the status of the construction industry is not consistent throughout the world particularly in the developing countries, which is a highly labour intensive, heavy accident rates are enormously different to developed world. This is because of human behaviour, minimum use of equipment, shortage of skilled workers, poor safety management, inaccessibility to personal protective equipments (PPEs) and lack of

infrastructure. Other obstacles include pressure of production and the complexity of the organization.

Like other developing countries, the construction sector of Pakistan has yet to respond to recent technological improvements. Lack of acknowledgement to technological advancements has not resulted in protected construction site. As a matter of fact, a huge portion of construction work being carried out by human resources has led to increased number of fatalities and accidents. The major reasons for safety non-performance, according to informal assessment, are; lack of mechanization of construction sector, lack of management practices which results in unsafe construction sites, construction delays, poor performance, poor product and process quality, insufficient safety regulations by the government, lack of workers insurance mechanisms and adversarial business relationships (Farooqui, 2008).

As compared to the past, the current decade is observing huge infrastructure development in Pakistan. There are many civil engineering projects in progress as well as under planning. It is believed that all of these projects have the capacity to manage the local industry to achieve glory and international recognition but it is only possible if appropriate strides are made to achieve the same. With this milestone for wonderful era of development, however, the challenges are still higher. The single most challenge that requires quick and strong improvements is safety at sites. It is very important that all occupational injuries and fatalities should be given serious attention. It is also need of the hour to inculcate the higher level of awareness among all employees and employers of the significance of HSE at worksites.

The current study will focus on how HSE are managed on housing construction sites in Lahore, Pakistan and what practices are employed by the management for HSE risk assessment at project sites. Furthermore what are the challenges construction industry is facing in terms of its performance and to provide suggestions for sustainable improvement.

1.1.Problem Statement:

Pakistan's construction industry has experienced significant progress in construction activities especially in big cities like Karachi, Lahore and Islamabad. The rapid flow of urbanization has increased demand by residential and commercial consumers of Lahore city services which has heightened the number of construction projects. This development has provided employment opportunities for vast groups of labourers, both skilled and unskilled. The construction sector is a main part of Pakistani economy and considered as the driver of

economic growth. Regardless of its importance, construction sector is considered as very hazardous where construction workers are open to causalities and ill-health issues. This inappropriate scenario has been a significant risk to the productivity and the progress of construction projects as well as reduces the labour force and the economy of the country (ILO, 2011). How to decrease the hazards and health issues at construction sites in Pakistan has been a real challenge for a long time.

Previous studies showed that main causes of accidents are linked to the special nature of the industry, human attitude, difficult working conditions and poor health and safety management which result in unsafe working methods, equipment and procedures. Attention needs be placed on training and utilization of comprehensive health and safety programs in both developing and developed countries (Farooqui, 2008).

Health, safety and environmental regulations is enforced on work sites to follow sufficient safety related systems designed to react to potentially hazardous project conditions as well as shaped to take the operation to a secure state when predetermined conditions are ignored. This is necessary for successful execution of a safety management mechanism for the resources and control of work environment systems and human behaviour, which collectively relative freedom from those conditions and situations, which can cause injury, disease, death or property loss (Samelson and Levitt, 1982). Therefore existence of a HSE culture in construction is highly needed which should be concerned with the components of the ability to govern health and safety issues from top to bottom organizational attribute approach. This HSE culture is generally dependent on a HSE climate which is explained by the workers' understanding to play a HSE role in the work place (Mohamed, 2003).

Regardless of the role that constructions industry and workers play in national economy, they are exposed to various challenges. This varies from poor pay to poor working conditions /environments which lead to health, safety and environmental problems. They may expose to materials that can cause severe health problems, hence, affect the productivity of the workers in the long run. Therefore there is need to set up the nature of hazards and factors that influence HSE at construction sites in Lahore, Pakistan. This is quite important because healthy labour force can play a key role in the social and economic development of the country.

1.2. Research Objectives:

The purpose of this paper is to examine the relevant data with the primary objectives of identifying related occupational HSE practices of all the stakeholders involved in Housing construction sector in Lahore, Pakistan. In this study I will try to target multi-storey buildings where there are plenty of such construction activities that require extra precautionary measures for safety for both workers and equipment.

This study attempts to explain the following research questions especially in relation to the Pakistani context.

1. What are the major issues faced by Pakistani construction industry and how are they affecting them?
2. What methods are used for HSE assessment on construction sites and what else need to be done to achieve better outcomes of HSE training?

On the basis of this experience, I will try to develop strategies to improve HSE issues in the construction industry.

2. Literature Review:

The health, safety and environmental (HSE) conditions of the construction industry has been improving. HSE concerns have been recognised as an important business in the worldwide construction industry. There are many factors which cause construction site accidents. These can be lack of proper training, deficiency of safety equipment, insufficient enforcement of safety, unprotected methods and sequencing, unstable site conditions, not using provided safety equipment, poor attitude toward safety and abnormal, sudden fluctuation from prescribed behaviour (Toole, 2002)

The HSE conditions in the construction sector of Pakistan are quite poor. Most of the work in the construction sector executed by human toeing which has led to increased number of injuries and casualties. Although national statistics show that the injuries in the construction sector is slightly decreased but it is still very high as compared to the developed countries standards.

The main purpose in carrying out literature review is to gather information on the Health, safety and environmental issues on the construction sites. The main sources of information are academic journals, seminar and conference articles and books. The research begins with a

comprehensive literature review on health, safety and environmental issues in the construction industry. The initial focus will be on the nature of the scope of the construction industry and the dramatic level of occupational injuries and casualties occurring throughout the world are highlighted in order to show the importance of regulating health, safety and environmental performance. Afterwards the focus will be on the factors responsible for main causes of sites accidents with the effect of globalization will be analyzed. Lastly I will discuss the challenges faced by developing countries such as the Pakistan is in enforcing effectively health, safety and environmental regulations in the construction sector.

2.1. Definitions of key terms:

Before going into details of occupational health, safety and environmental issues, I would like to define these terms so that we could have a clear understanding of these issues in the construction industry.

Health is defined as the “the protection of the bodies and minds of people from illness resulting from the materials processes or procedures used in the workplace” (Hughes & Ferrett, 2011, P.3).

Safety is defined as “the protection of people from physical injury. The borderline between health and safety is ill-defined and the two words are normally used together to indicate concern for the physical and mental well-being of the individual at the place of work” (Hughes & Ferrett, 2011, P.3).

Environment is explained as the condition in which we live or work and the way it influence how we feel or how effectively we can work (Cambridge dictionaries online, 2015).

Hazard is anything that may cause harm or damage to someone under certain conditions at work (Canadian centre for Occupational health and safety, 2009).

Risk is the probability, high or low, that a person will be harmed if exposed to a hazard (Canadian centre for Occupational health and safety, 2009).

Risk assessment is a process that identifies the things, situations, and processes at workplace that may cause harm to the people and after evaluation (how severe is the risk) implements the measures needed to control the risk of injury/ill health to as low a level as possible (Canadian centre for Occupational health and safety, 2009).

Risk management is the process of establishing, evaluating and analysing expected and possible damage on construction sites and of forming mitigation strategies in order to reduce the risk of damage (Paolini et al., 2012).

2.2. Scope of the construction industry and general problem description:

The construction industry plays an important part in the social and economic development of any country. The scope of construction industry is quite wide and larger civil engineering projects such as road and bridge building, water supply and sewage schemes and river and canal work all come within the scope of construction (Hughes & Ferrett, 2011). Therefore the construction industry is a combination of different organizations which influence the construction process directly or indirectly. These include property developers, engineers, architects, accountants, contractors, managers, workers, subcontractors and trades.

The most common activity in construction is building work which can be domestic, commercial or industrial in nature. This work can be new building work, e.g. a building extension or more generally the maintenance or repair of the existing buildings. The buildings can be occupied or unoccupied. These projects can start with a limited or total demolition of a structure which is a risky operation. Most construction projects deal with a range of activities such as site clearance, dismantling of building structures, the felling of trees and disposal of waste materials. The construction work could involve risky tasks, such as roof work or contact with dangerous materials, such as lead or asbestos. The site activities will involve the loading, unloading, storage of materials and site movements of vehicles and pedestrians. Ultimately, the construction processes themselves are quite dangerous. These processes incorporate decoration, fabrication, installation, cleaning, installation and the removal and maintenance of services. Construction industry also comprises the use of woodworking workshops together with woodworking machines and their related hazards and the use of heavy machinery. It will sometime require work to take place in confined places, such as excavations and underground chambers (Hughes & Ferrett, 2011). Therefore construction is considered as one of the most hazardous industries in the world. It is generally said that health and safety conditions on construction sites is not satisfactory as the level of occupational injuries and fatalities is quite high when compared to other industries. The same situation can also be found on construction workplaces. The construction processes involve dangerous activities like manual handling, working at height, exposure to hazardous materials, demolition, lifting operations, concrete pumping, scaffolding and ground works, bulk

materials and heavy machinery handling, as well as the different jobsite personnel and their regularly changing worksites (Cole, 2003).

Most of the construction sites are temporary in nature and are constantly changing. This situation mostly leads to compromise on health and safety issues such as the requirements of sufficient welfare facilities or the safe management of site traffic. Furthermore the construction industry is distinguished by a very fragmented structure in the production period with a large number of companies. This kind of organization frequently makes management tasks in the construction sector difficult and complex. It is not surprising that many sub-contractors are engaged in a single building project with diverse influence on their own and other sub-contractors' working environments. Another characteristic of construction industry is the unfavourably high supervisor-worker ratio. The supervisors who have more personal and positive relationship with workers have more favourable safety performance records (Hinze, 1997). This relationship is very hard to maintain if the ratio is too high, which is usually the case within the construction sector.

To sum up, it can be said that most of the contractors and subcontractors are not willing to enforce occupational health and safety regulations at construction sites.

2.3. Health, safety and environmental challenges in construction industry (Developing Countries):

There is much variation in occupational structures, working conditions, environment and the health status of workers in different parts of the world, in different countries and in different areas of the economy. Therefore the structure of construction industry is not consistent throughout the world. Nowadays construction industry plays a key role in expanding the economy of any country, especially a developing country. It supplies the infrastructure required for other sectors of the economy to thrive. Many studies have indicated that construction industry brings a level of economic development in the country. The construction industry everywhere faces difficulties and challenges. Nevertheless, in developing countries, these issues and challenges are present together with a general level of socio-economic stress and a reduced productivity rate when compared to developed countries (Ofori, 2000). However it is presumed that the construction industry is a good source of employment at different levels of skills, from a general labour to semi skilled, skilled and specialist workforce.

In selecting diverse approaches to health and safety in developed and developing countries, two key differences can be recognized. The most important is the existence of legislation and its efficient execution; the second is hazard awareness. There are many laws and legislations exist in developed countries and are executed effectively. Appointed health and safety supervisors promote hazard awareness with the help of frequent safety training programs. On the other hand, in developing countries health and safety rules hardly exist at all. The construction industry in developing countries is generally underdeveloped, dysfunctional or non-existent. Many developing countries, especially in Africa and Asia, do not have consistent national building codes and regulations. Wherever they exist they are inappropriate, out of date, ineffective, outmoded and based on conditions which prevailed while they were still being colonised (Singh et al., 1999). For example in India, there are: no training programs for workers and supervisors, no orientation for new staff or workers is carried out; hazards are not highlighted and no health and safety meetings are held (Koehn et al., 1995). Employees and workers are required to learn from their own mistakes and practice. Furthermore, lack of medical facilities, poor housing and inadequate sanitation conditions tend to exist on remote projects. In addition, the regulatory authorities are normally very inefficient in implementing rules effectively and work hazards are either not observed at all or identified as to be less hazardous than they actually are (Singh et al., 1999).

2.4. Health and safety and environmental issues in Pakistani construction industry:

The total population of Pakistan is about 188 million. 48% of the population is young aged 15-49 and 56% (age 15-64) is in productive age group. According to Pakistani statistics the total labour force of Pakistan is about 60 million of which 56 million are employed and 3.76 are unemployed (GoP, 2015). The construction industry contributes 2.4% towards GDP of Pakistan and accommodate 7.33% share of the total labour force during 2012-13 as compared to 7.44% in 2013-14. Government set the target of 5.7% growth rate for the construction sector during the fiscal year 2013-2014 but it grew by 11.31% as against (-1.685) during 2012-13 (GoP, 2015). During 2013-14 around 14% of constructions workers suffered injuries /diseases (GoP, 2015). Since this industry growing sharply but still many labour laws don't apply to this sector.

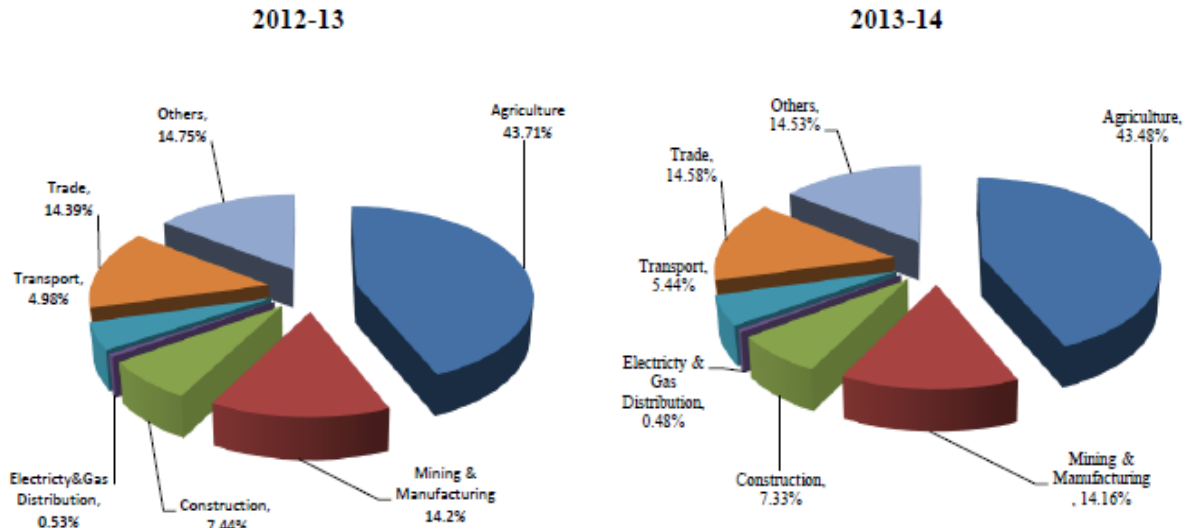


Figure 1: Employment Distribution in Pakistan (Source: (GoP, 2015)).

OCCUPATIONAL INJURIES/DISEASES -DISTRIBUTION OF EMPLOYED PERSONS BY MAJOR INDUSTRY DIVISIONS

Major Industry Divisions	2012-13			2013-14		
	Total	Male	Female	Total	Male	Female
Total	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture, forestry, hunting and fishing	49.1	42.8	92.4	51.2	46.5	86.4
Mining & quarrying	0.2	0.2	-	0.3	0.3	-
Manufacturing	13.3	14.7	3.7	14.2	14.9	9.2
Electricity, gas and water	0.5	0.6	-	0.3	0.4	-
Construction	15.2	17.3	1.0	14.1	15.9	0.6
Wholesale & retail trade and restaurants & hotels	9.2	10.5	0.1	8.6	9.5	1.1
Transport, storage and communication	7.3	8.2	0.6	7.5	8.4	0.2
Financing, insurance, real estate and business services	0.1	0.1	-	0.1	0.1	-
Community, social and personal services	5.1	5.6	2.2	3.7	4.0	2.5

Note:- (-) Stands for no information

Table 1: Source: (GoP, 2015)

Construction industry in Pakistan is more labour intensive than that in the developed countries, involving 2.5-10 times as many workers per activity (Farooqui, 2008). Generally workers which are hired on daily wages are not only unskilled but also illiterate and migrate in groups throughout the country in search of jobs. Koehn et al. (1995) conducted a study in India which showed that workers are tend to unskilled and work in factions. In Pakistan the productive labour for mining and earthwork mostly come from Khyber Pakhtunkhwa province. Since India is a big country having different cultures, the Communication issues that are more critical in India because of different cultures and languages as mentioned by Koehn et al. (1995) are not as serious in Pakistan.

In Pakistan, the labour conditions at construction sites are similar with other developing countries. There is considerable difference between small and large contracting firms. Due to lack of health, safety and environmental regulations in the country, it is not the priority of small contracting firms to provide training or awareness to the hired workers such as working in hazardous zones of the project. As a result construction personnel are not furnished with the protection available to industrial workers. The absence or lack of such a set of health and safety regulations negatively affects the execution of health and safety on the working site, thereby resulting in more unsafe circumstances in the Occupational Health and Safety (OHS) filed for workers. Health and safety laws are also weak; no single specific piece of regulation handling with occupational health and safety exists. The approaches for the setting of standards and codes of practice have not been established.

Most of the large firms do have a health, safety and environmental policy, on document, but workers or employees are not aware of its existence. However, a number of major construction companies show a concern for health and safety and have demonstrated several health and safety procedures. They also offer training for workers and supervisors and keep safety personnel on the jobsite. However for most of the contractors profit maximizing is the prime objective. Insecure conditions exist on both small and large construction sites and workers are subjected to several hazards (Farooqui, 2008).

In developing countries such as Pakistan, most of the mega projects are carried out by joint ventures and some of the multinational construction companies based in Pakistan have good reputation in Middle East countries. These companies place proper emphasis on site regulations and safety standards. These companies employ their workers during their full project tenure and normally cease them when project is complete. Generally the initial health and safety training is provided to the newly appointed labour force but job specific safety training is lacking on the construction sites. Though no data is available, it is the general believe within the industry that on construction projects, primarily the fatality or injury rate is higher in the daily wages workers as compared to employees employed permanently. Since job in construction industry is considered difficult, most workers don't want to enter into this field. Nevertheless, illiterate and unskilled labour enters into construction sector because they don't have other alternative to earn money. Furthermore, it is very difficult for a small contractor to evolve health and safety awareness among the daily wages workers especially being unskilled and illiterate. Usually less budgets and resources allocated at both companies

and government level for health and safety activities further intensify the situation (Qazi et al., 2006).

Injuries on work site usually are unreported; however, if essential, workers might get first aid or initial medical care. In most of situations, preliminary medical treatment or compensation is unavailable. Workers also agree that some of the accidents are happen because of their own negligence and considers that construction is dangerous sector to work. However, serious accidents involving the fatality of a labourer may be reported because financial expenses and legal proceeding could be involved (Farooqui, 2008). Although fatality is reported to the police but compensation is not always fully paid to the sufferer's family. However, large reputable companies provide compensation for accidents depend upon the firm's policy whether a victim is regular employee or short-term employee. Lack of good food and other facilities also result in problems and disappointment among workers. For labourers absence of job security also brings in mental stress and safety concerns on construction sites. In some cases workers and staff sometimes are under the influence of alcohol and drugs, but regrettably crew members are not examined for drugs and alcohol before the start of and during work (Qazi et al., 2006).

Repairs and inspection plans generally not followed, and only after a collapse is equipment repaired. This attitude results in loss of time, unemployed workers and project delays. It might also cause harm to the property. Crashing of vibrators, concrete mixers, water pumps and tractors are common. Electrocutation is further an important hazard because of the use of low quality electrical equipment and underground cables. Labourers, especially young people, take risks and usually do not follow safety rules or use personal protective equipment (PPE) such as safety helmets, safety shoes, safety belts, goggles etc. even for conducting hazardous construction activities (Farooqui, 2008). It is the obligation of the management to supply essential PPEs to the workers for carrying out their routine construction tasks in a safe mode.

One of the disrupting causes that restrain Pakistan from developing a comprehensive construction health and safety program is widespread corruption, an outcome of bureaucratic controls. For example if there is any accident on construction site due to lack of health and safety practices, the specific low rank supervisor or technician, not the construction manager, is generally held guilty and may in some special cases be prone to physical abuse and ill treat from the sufferer's group of friends or relatives. In certain situations, the supervisor may also

be accused of criminal offence. Nevertheless, cash payments are generally accepted instead of pressing charges. Furthermore, since most of labourers are generally non-residents of the local area and are usually unaware of their rights, hazards are normally not reported to the corresponding authorities or, if reported, are lost in the local bureaucracy (Farooqui, 2008).

Managers and contractors both stress on health and safety issues before work starts, but as the work gains ground their fear for deadlines becomes a preference and they incline to pay less thought to health and safety. On mega projects, the owners may give medical facilities at the site, but eventually health and safety is the contractors' obligation (Farooqui, 2008).

The major accidents or injuries confronted by construction firms in Pakistan on their working sites are fall injuries, heat stroke, struck by injuries, injuries by wastage and raw materials, head injuries, Eye injuries and burning cases (Farooqui et al., 2007). According to Qazi et al. (2006) main causes of injuries are listed below:

- In the cities where the property value is high, construction of basements in big housing complexes is carried out specifically for parking of vehicles. Although occasionally, excavators are usually used but most of the times workers do the excavation and donkeys are being used for carrying the excavated material in the residential areas. During these excavation operations, cave-in occurs because of less shoring and results in loss of lives.
- In multiple-storey building construction, the regular accidents are falling down from scaffolding while working on higher levels. Accidents are attributed to the fact that safety belts are barely used.
- Steel cutters and Carpenters hardly used glasses while cutting a part of steel bars and wood respectively.
- Most common accidents occur on construction sites are because of carelessness and maintenance of tools. Electrical equipment, cutters and welding machines are not occasionally checked for maintenance.
- Temporarily placed power lines and loose connections results in serious shocks and even occasionally casualty occurs on a construction site.

In addition to health and safety issues there are many environmental hazards also on construction sites. During the extraction of construction materials, their transportation, the period of construction and use of buildings, substantial amount of energy are used. These activities contribute major contribution to the overall production of carbon dioxide which

intensifies the ‘greenhouse’ effect. During the construction process individual and communities can be seriously affected by the process of construction. Environmental issues in construction industry generally include soil and ground contamination, construction and demolition waste, dust, noise and vibration, blazing lights, solid and liquid waste, ground movements, messy sites and fallen items. These types of pollution and hazards can not only disturb people residing nearby, but also affect the health and well being of people in the entire area (Li & Chen, 2007).

2.5. Health, safety and environmental regulations in Pakistan:

As compared to developed countries, Pakistan is having a very weak regulations regarding Health, safety and environmental issues on working sites. Although there are some regulations exist but the regulatory authorities are very weak or non-existent, many employers only pays ‘lip service’ to the regulations. There have been cases where first aid kits were provided on work site ‘for show’ and never used by injured workers. As I mentioned before, Injuries are generally not reported and the owners provide some kind of cash compensation to injured employees (Koehn et al., 1995).

Occupational health, safety and environmental issues are not completely handled by single law. There are several laws governing health, safety and environment for different divisions in Pakistan. The different sections of occupational health, safety and environment are covered by the following regulations:

Labour rights in the constitution of Pakistan:

The constitution of Pakistan comprises a series of arrangements with regards to labour rights established in Part II: Fundamental rights and Principles of policy (ILO, 2004)

- **Article 11** of the constitution prevents all types of slavery, forced labour and child labour;
- **Article 17** prescribes full right to exercise the freedom of association and the right to form unions;
- **Article 18** provides the right of its citizens to enter into any lawful occupation and to carry out any trade or business
- **Article 25** mentioned that everybody is equal in the eye of law and prevention of discrimination on the grounds of sex alone;

- **Article 37(e)** forms arrangements for strengthening just and human conditions of work, ensuring that children and women are not employed in professions unsuited to their age or sex, and maternity benefits for women in employment.

Labour Laws:

In addition to constitutional provisions, different laws have been established for the benefit of labour force. The major regulations protecting the worker are the Workmen's Compensation Act, 1923, and the Employees Social Security Ordinance, 1965. The legislations enforced by the Department of Labour and Human Resource, Pakistan are briefly discussed below:

Workmen's Compensation Act, 1923

This Act was established to provide for the payment by employers to their workmen of compensation for injury by accident. This Act is applicable to all types of industrial or commercial establishments, construction, railways and mines employing 10 or more workers. In the case of temporary disablement, the Act provides for a half monthly payment of wages for a period of one year or for one-third of monthly wages for five years in the case of chronic lung diseases. The Act also provides for specific exceptions. The employer will not pay for the injury if it occurs for a period of less than four days. The employer will also have no responsibility for injuries if the worker deliberately disobeyed the instructions or safety rules (AMRC, 2013).

The Employees Social Security Ordinance, 1965

This ordinance was applicable to industrial and commercial establishments employing more than ten employees. The contingencies covered under this ordinance included sickness, employment injury or death, maternity and related matters (AMRC, 2013).

West Pakistan Industrial and Commercial Employment (Standing Orders) Ordinance, 1968

This ordinance makes special arrangements for the industrial or commercial establishment where 20 or more workers are employed and is required to comply with the terms and conditions of employment of workers and other incidental matters enclosed in the standing order. It provides for compulsory group insurance, termination gratuity, and wage payment during layoff, dismissal and disciplinary processes. Organising and bargaining rights in Pakistan are very limited. The working sectors i.e. textile, agriculture, garment, teacher,

hospital workers are not covered under the country's industrial relations system. The workmen of these sectors are more vulnerable due to their contractual status of job. There is no direct legislation for them to overcome their uncertain employment problems (AMRC, 2013).

The Factories act, 1934

This act is applicable to almost all the industries. This act applies to premises where ten or more workers are employed. It established the actions to be taken in respect of workers' safety and protection against occupational diseases. It demands providing for facilities, amenities, lighting, ventilation, fire precautions, cleanliness, maintenance, dust and fume control. This act also covers hours of work, rest intervals, special provisions for adolescents and children, sick leave and weekly and annual holidays. Some of the rules under this Act also provide special precautions for special hazardous occupations (Khan, 1998).

Other legislation concerning the occupational health, safety and environment include:

Workers Welfare Fund Ordinance, 1971.

The Employer's Liability Act, 1938.

The Employer's Old Age Benefit Act, 1976.

Employees' Cost of Living (Relief) Act, 1973

Bonded Labour System (Abolition) Act, 1992.

The Hazardous Occupations Rules, 1963.

The Fatal Accidents Act, 1855.

Dock Labourer Act, 1934.

Industrial Relations Act, 2013

Unfortunately, the health and safety measures established in most of the above mentioned laws have not kept momentum with the quickly changing times, conditions or industry requirements. Many of the sectors with critical OHS (Occupational health and safety) hazards are not protected by these laws, even though they comprise very few technical standards. In addition the occupational exposure limits (OELs) are still missing from Pakistan's labour laws. These laws thoroughly require revision and updating (Awan, 2001). Furthermore, due to the inadequacy in implementation of labour regulations, the majority of the construction accidents are not reported to the labour department. It therefore puts a question mark on the reliability of available occupational health and safety data. Therefore, without the reliable information on the basic causes of accidents or injuries, it will be difficult to establish useful

measures to overcome the rates of accidents or to improve the general health and safety standards within the construction industry of Pakistan.

2.6. Pakistan Labour policy 2010:

Labour policy is a time limited strategy developed by the government in consultation with other stakeholders that explains comprehensive codes and suggestions connected to work and workers' rights. Assurances of economic, social and political rights are the critical features of labour policy. This policy also gives full guarantee to all citizens by the country's constitution, international treaties and ILO conventions. The labour policy was announced on 1st of May 2010 (Hisam, 2010).

The major points of the policy include: right of forming unions, adjustments of rights and responsibilities among workers and employers, welfare of the workers, security of jobs, merit system in promotions, strengthening social insurance schemes, facilitating or creating job opportunities for people and elimination of forced and child labour (GoP, 2010).

Most of the experts are unhappy with the policy document. According to them this policy is lacking in research and vision on ground realities. This also shows government's own unwillingness of past and present actions. Labour policy has, by and large, remained separated from legislations in Pakistan. None of the previous five labour policies 1955, 1959, 1969, 1972 and 2001 materialize into pro-labour laws (Hisam, 2010).

Although government did make commitment to ensure occupational health and safety legislation in the labour policy 2010 but until now government didn't fulfil its pledges. Although, this time they have made more commitments e.g. for the establishment of tripartite monitoring bodies that will monitor work conditions in the country. It has been 5 years since then, but still there is no progress on the formation of this commission.

3. Materials and Methods:

3.1. Study Area:

The study was carried out among construction sites in Lahore city, Pakistan. Lahore is the capital and the largest city of the Punjab province. It is also the most populous city of the Punjab province with a current estimated population of about 10 million who live within 305 sq miles. Lahore is currently having the 34th largest urban areas in the world (Demographia, 2015).

The reason to choose Lahore city is this because it is metropolitan city and an important commercial centre. Lahore's location, climate, growing population and Pakistan's increasing access to foreign markets make Lahore a city among others to attract investment in a number of sectors such as agro-processing, textile industry, hotel industry and real estate development. Investment in these areas called for development of existing facilities such as ware housing, retail shops, stores and Housing projects. Certainly there are lot of construction works going on in the Lahore city which have attracted thousands of workers from the neighbouring towns to be hired for skilled or unskilled construction works and this will make the study relevant.

3.2.Study Population:

The study population comprised of employees and labourers on Housing construction sites in Lahore city. These include owners, contractors, subcontractors, managers, safety officers and workers. I will try to target small, medium and large construction companies. The selected construction sites were multi-storey.

3.3.Research Design:

Three different methods were used to collect data from respondents i.e. Interview survey method, Questionnaire Survey and Case study. The details of the respondents are given below;

For Interview survey

Individuals	Number	Method
Management staff (1 construction Engineer, 2 Project Managers, 1 construction Manager, 1 contractor) (random sampling)	6 interviews were conducted with senior management staff from 5 construction companies	Structured Interviews

For Questionnaire Survey

Individuals	Number	Method
All the stakeholders on 15 construction site (Purposive sampling)	100 (15 site managers, 5 owners, 8 contractors, 5 sub-contractors and 67 site workers)	Questionnaire Survey

For case study

Individuals	Number	Method
Site management team	3 (1 site manager+1 safety officer+1 supervisor)	Focus group discussion
workers	6 (2 scaffold+2 steel reinforment1+2 concrete worker)	Focus group discussion

3.3.1. Interview Survey Method (Pilot study):

Interview survey was the first stage of research design. Face to face interviews were conducted with experienced management staff of 5 companies to capture their thoughts and suggestions on HSE risks and their sources in Pakistan construction industry. Simple random sampling was used to access management staff on construction sites. This method was utilized because it was not known if the HSE risks described in literature review also applied to the Pakistani construction industry. The interviews were structured and were having fixed questions (Appendix 2).

3.3.2. Questionnaire Survey (Pilot Study):

The questionnaire survey is also a part of the first stage of research design. At this stage the motive was to establish the perceptions of the key project participants (owners, contractors, subcontractors, managers, and workers) of the critical HSE hazards identified in the interview (above) stage. Fifteen ongoing large residential construction sites based in Lahore were selected for the survey through purposive sampling. Total 100 questionnaires (Appendix 1) were distributed among employees/workers on different work sites and were asked to give their response on certain HSE issues on work site. The data were analyzed graphically using Microsoft Excel.

3.3.3. Case Study:

The second stage of the research design is to conduct an in-depth research on how critical hazards (e.g. working at height, manual handling) are identified, and controlled on construction sites. For this purpose case study method was used. Before conducting further research on case study I have conducted interviews with two Government departments (Labour and Human Resource department & Environmental protection department) who are responsible to inspect all the construction sites. Later on, one large Descon Housing Project site was selected as the case study. This is an ongoing construction project located in the Lahore city. First interview was conducted with Descon Head of department (Human Resource) to find out how it facilitates the process of HSE risk assessment, communication and control. Secondly, one on site focus group discussion was conducted with the management staff to get views of the staff regarding HSE issues on work site. Thirdly, another focus group discussion was also conducted for case study with workers which will help us to validate the issues discussed with management staff (Appendix 2). Furthermore,

personal observations were also made during site visit and made checklists (e.g. use of safety equipment like safety belts/ropes for working on height, helmets, safety shoes, masks) on site. Instruments like Noise level meter and Luxmeter (measuring light standards inside work site) will be used to conduct readings and will be compared against standard values. Furthermore waste, housekeeping and dust management practices will also be observed on site.

4. Findings from Pilot study:

4.1. Interview Results:

The pilot interviews were conducted with six senior people in five different construction companies (project managers, contractors and senior engineers). The pilot interviews were carefully structured with simple questions (See Appendix 2). As a sample two interviews is also put in appendix 2. The interviews composed of two main parts:

- The first part of the interview includes information about company profile such as company name, business activities and respondent information such as field expertise and numbers of years of experience.
- The second part of the interview dealt with the health and safety risk assessment implemented on the construction sites by the company itself.

The interviews were based on structured questions in which one person asks predetermined questions about a selected topic. It is the responsibility of the interviewer and is allowed to explain the things to the interviewee if he/she doesn't understand or finds it confusing.

The results of the pilot interviews can be summarised as follows:

- 3 out of six respondents mentioned that they were not aware that their company had regulations regarding health and safety. The remaining 3 respondents gave a positive answer. But two out of these three were not very much sure about these regulations and hence used remarks such as "I think so" and "as far as I remember, yes". Only one respondent said surely that they are complying with the strict health and safety regulations.
- Two out of six respondents mentioned that they provide necessary health and safety training to their workers whereas 4 respondents mentioned that don't give training and workers learn it by themselves or from their experienced colleagues.

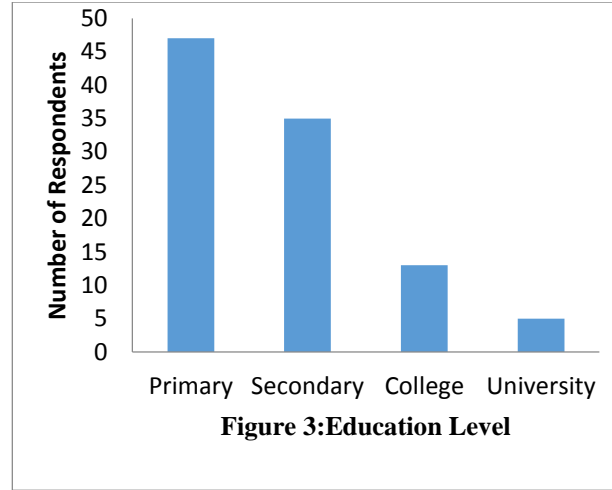
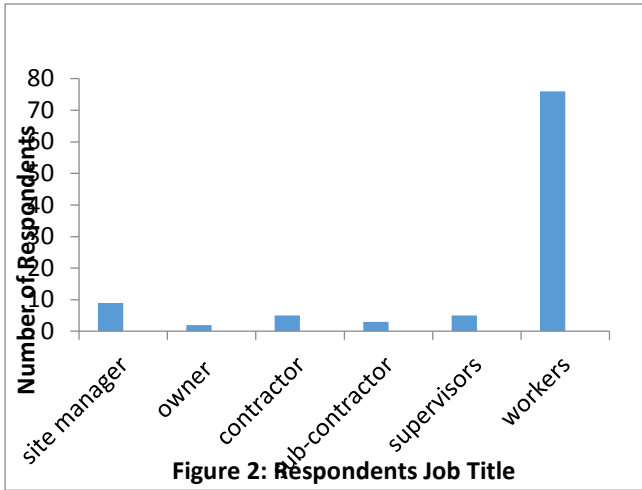
- All the interviewees accepted that they don't have a committee entirely assigned to health and safety.
- Four out of six respondents revealed that not all accidents are recorded. Only the serious accidents are recorded and reported to the relevant department. Remaining two respondents admitted that they recorded all type of accidents on construction sites.
- Only one respondent accepted that their employees/workers are medically ensured against injuries/accidents which occur on site. Remaining five didn't have such kind of policy.
- All the respondents agreed that accident under reporting is a major issue in the Pakistani construction industry.
- All the interviewees admitted that establishing the serious factors that influence the success of accident reporting mechanism is essential.

4.2. Results from Questionnaire survey and discussion:

The questionnaire survey (Appendix 1) was conducted with site managers, contractors, sub-contractors, supervisors and workers working on the site. The data collected from respondents has been put into the following sections:

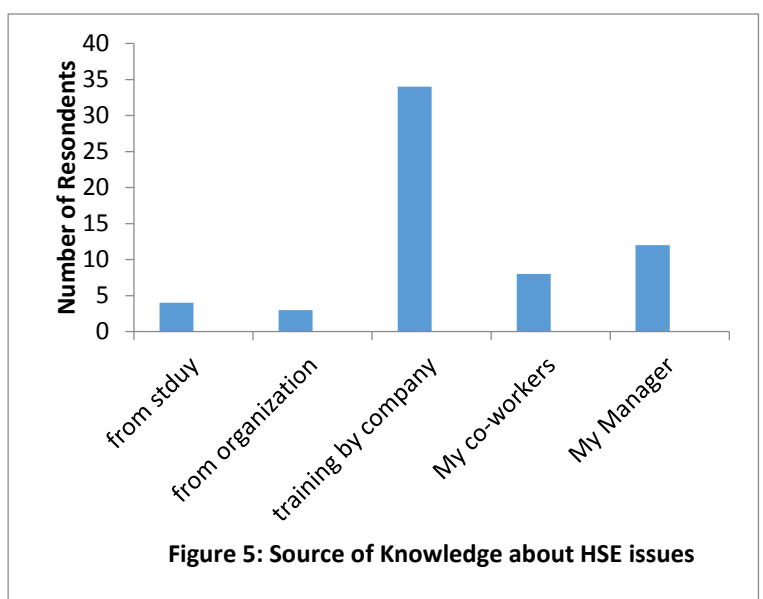
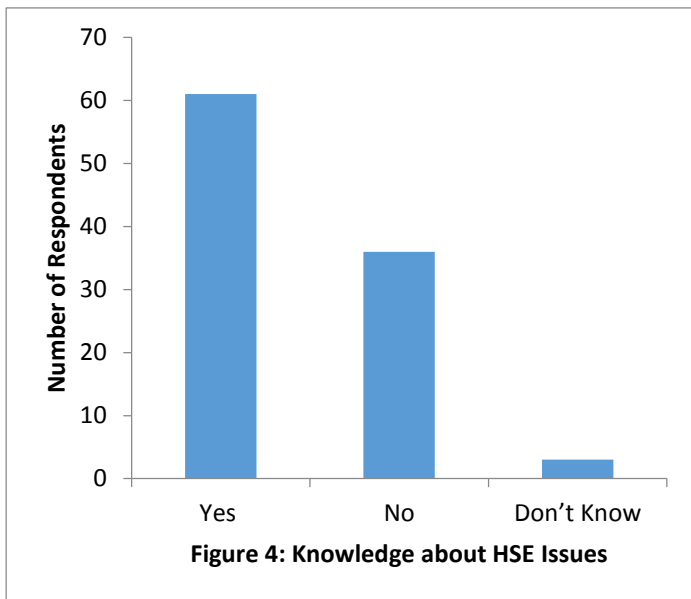
4.2.1. Job title and Education level:

All respondents (100) were male as culturally most of the activities are done by men on housing construction sites in Pakistan. Figure 2 indicates that there were 9 site managers, 2 owners, 5 contractors, 3 sub-contractors, 5 supervisors and 76 workers in the pilot study. Figure 3 show that very few respondents were having higher level education. 82% were having primary and secondary education and 18% were having college and university level education. None of the construction worker was having college or university education. It's mostly the site manager, owner, contractor or sub contractors who have college or university education. The low level of education by construction workers will have problems in communication and the way they perceive health and safety hazards.



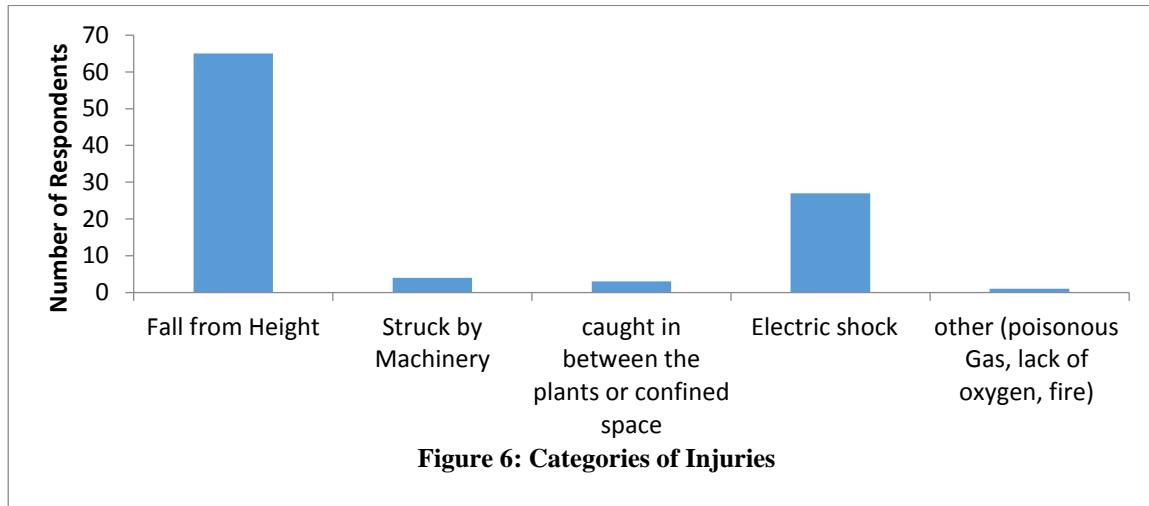
4.2.2. Knowledge about Health, Safety and Environmental Risks:

Figure 4 shows that 61% of respondents were having knowledge about HSE issues and 39% were having no knowledge or information about HSE hazards. Again most informative section was the top level management on construction sites. Figure 5 shows that 55% respondents who were having knowledge about HSE issues got training from their company where they work, 4% from organization (independent body where companies send their employees to get necessary health and safety training), 19% from their managers, 13% from their co-workers and 6% by studying themselves.



4.2.3. Categories of injuries on workplace:

In this section, the respondents were asked to rate the enlisted categories. The data showed following trends as shown in the Figure 6:-



The majority of respondents (65%) feel that fall from height is the most prominent injury having higher probability of occurrence in the housing construction projects. The next category according to respondents (27%) is electric shock because of open and loose connections and wiring networks spread out in under construction housing sites. The other options are; struck by machinery, caught in between the confined spaces and fires etc.

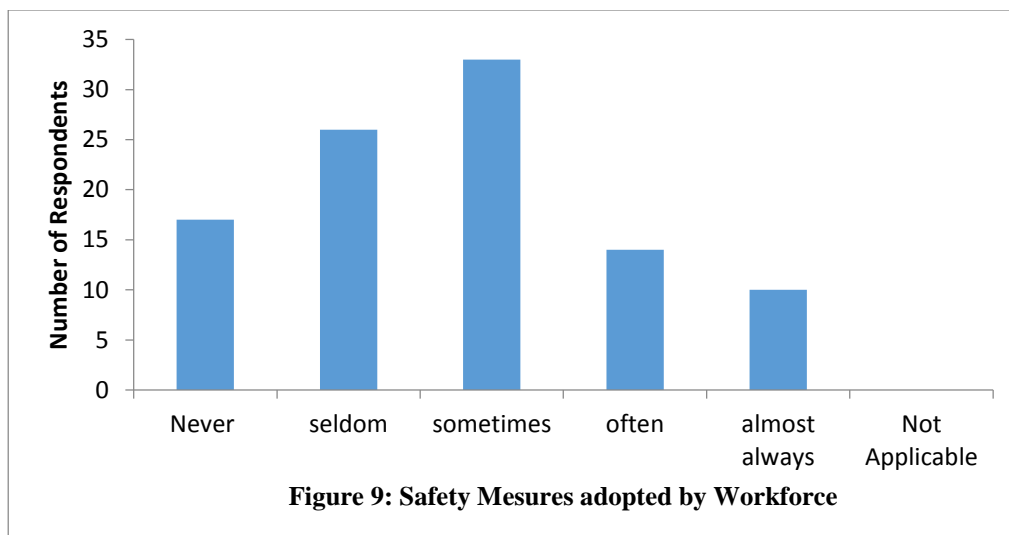
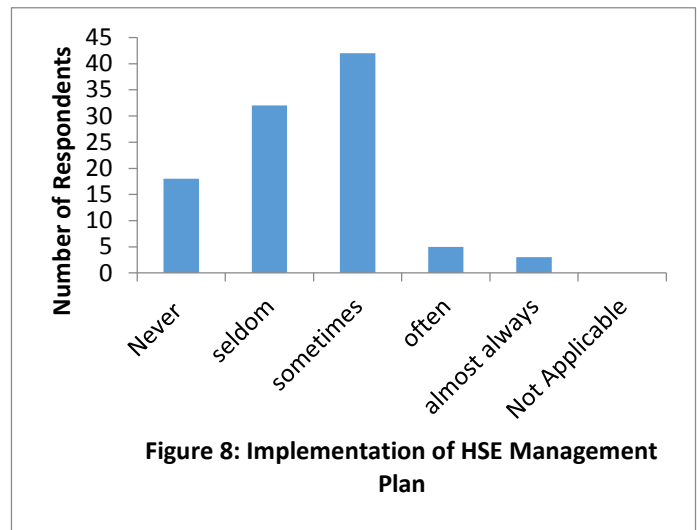
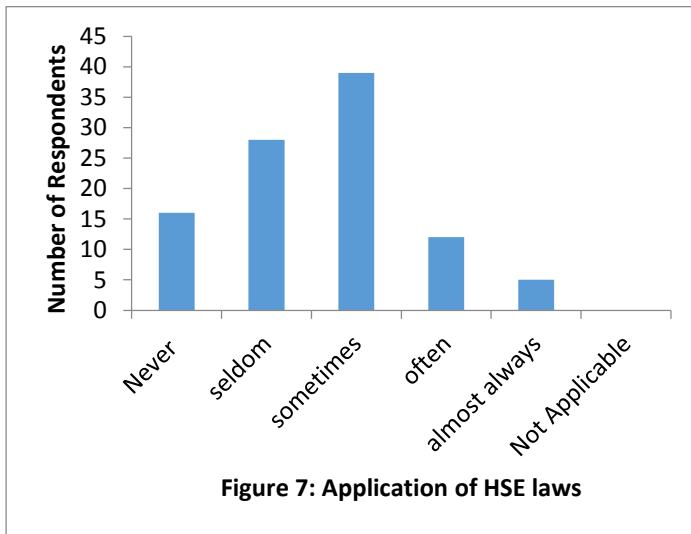
4.2.4. Application of HSE rules and regulations on construction:

As long as there is no regulatory authority for implementation of HSE laws in construction projects, human casualties cannot be stopped. The Figure 7 showed that 39% of respondents believe that occasionally these do exist but not enforced in true spirit. 28% state that they are seldom adopted while 16% declined the presence of any HSE rules.

In addition to governmental regulations there is also companies HSE management plans which typically covers areas like, safety committee, safety inspections, safety audits and training plans. In the following Figure 8 majority of the respondents revealed that the plan doesn't exist in Housing construction projects. Only 8% confirmed there are HSE plans on site.

When people were asked about the following of any safety instructions under guidance or on their own, the majority of respondents (33%) revealed that they follow instructions

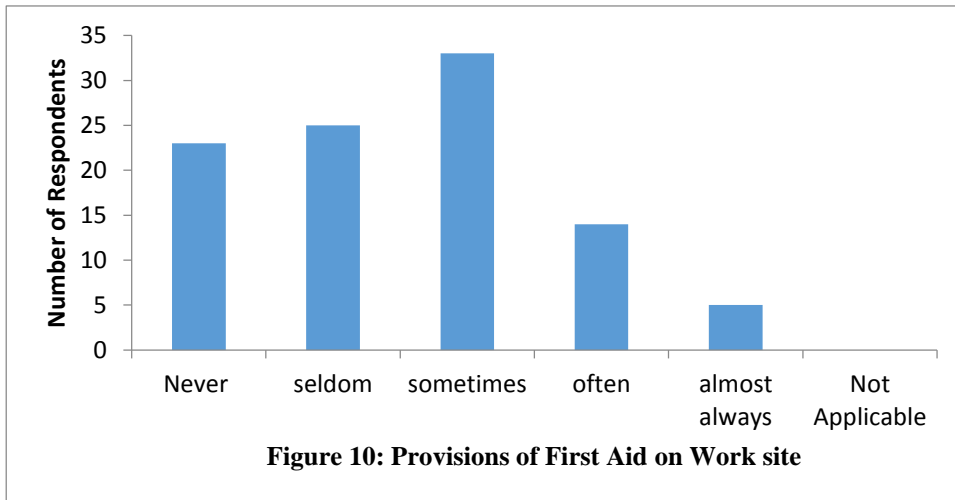
sometimes while 43% state that they follow instruction seldom or never (Figure 9). So, Lack of HSE training can cause major accidents or minor injuries.



4.2.5. Provisions of First Aid on Construction sites:

Housing construction industry is considered one of the most vulnerable industries in Pakistan which involves huge human population. The workers in the construction industry are vulnerable to critical working conditions and varying level of accidents. Therefore it is important for construction firms to make necessary medical preparations in order to prevent such incidents. The Figure 10 showed that 33% of respondents were sometimes having access to first aid provisions, compared to 23% never, 25% seldom, 14% often and 5% always. This

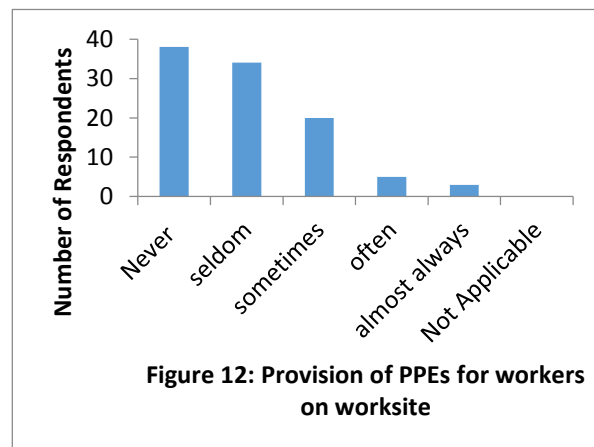
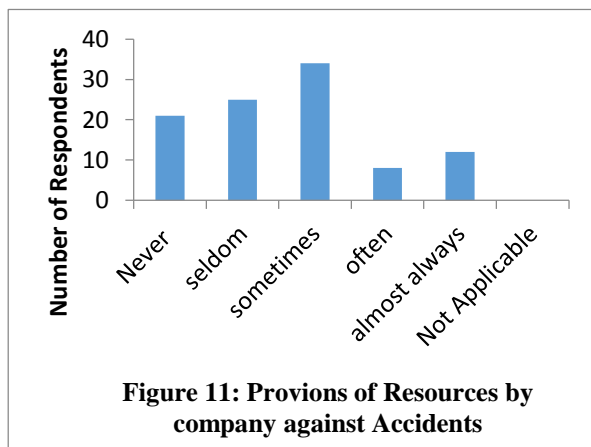
situation will have drastic impacts on the health and productivity of the construction workforce.



4.2.6. Safety against major causes of accidents:

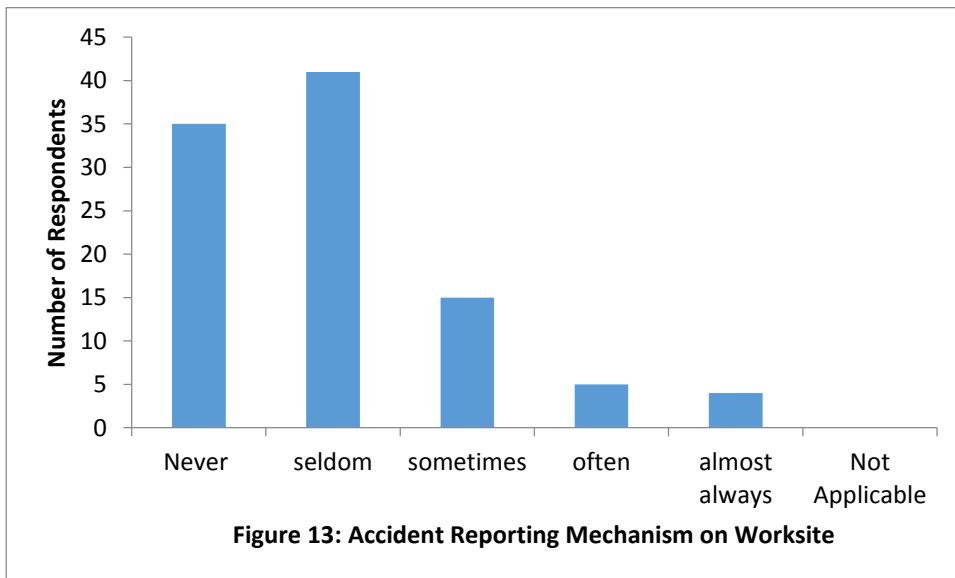
We observed in Figure 6 that the major causes of accidents are falling from height and electric shocks. Under this section we will try to find out whether companies provide enough resources and opportunities to protect against any incidents. Unfortunately this area is seriously over sighted. The total response count remained 100, out of which only 12% mentions that they always have the availability of resources by construction companies whereas 34% said that they have it sometimes (Figure 11).

Personal protective equipment (PPE) is essential while working under difficult conditions like extreme heat or cold and windy conditions. PPE generally comprised of gloves, gum shoes, safety belts, safety ropes, reflecting jackets and head phones. The data (Figure 12) showed that this point is not being given the required attention. Only 20% respondents said that they sometimes have access to PPEs whereas 38% said they have never got access to PPEs.



4.2.7. Accident reporting mechanism:

In developed countries, normally safety officer deals with the construction management plans. These countries have implemented safety rules and provisions for the safety of their workers. But here in our pilot study the majority of the respondents do not represent a good picture as showed in Figure 13. Only 4% said that they have full mechanism of accident reporting whereas 41% said they seldom have accident reporting mechanism.



4.2.8. Existence of waste and environment management plan on worksite:

It is necessary to keep construction site areas clean and systematic from construction waste and debris. Again there was not a healthy response from the respondents which is one of the major concern related to occupational health and safety. 37% respondents stated that they sometimes have waste management plan whereas 35% said they have never seen any waste management plan (Figure 14).

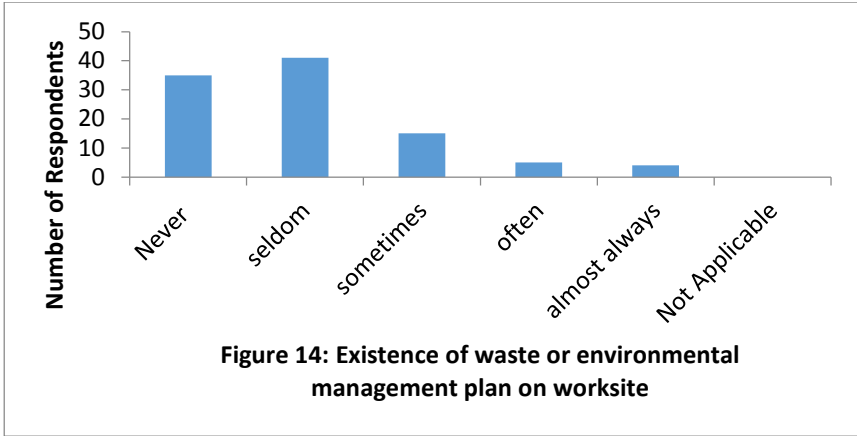


Figure 14: Existence of waste or environmental management plan on worksite

5. Findings from Descon housing Project site (Case Study):

This chapter represents the results of the data collected from Descon construction site in Lahore, Pakistan. The results focused on the health, safety and environmental issues and communication at the Descon construction site, and how legal and individual factors and the work environment influence the process.

5.1. Description of the Project:

The Descon project comprised the construction of a new residential building in Lahore city. Descon Project site is located along Ferozpur road. The scope of the work is the construction of the six storey residential building. The owner and the principal contractor of the project is also Descon Engineering Ltd. The project had employed 75 workers. The project work started in August 2014 and is expected to be finished in December 2015. The contract value is 242 million rupees, equivalent to US\$ 2,375,459. The major activities in Descon building project are excavation, concrete columns, slabs, beams, steel re-bars, brick blocks, plaster flooring, ceiling, aluminium work, elevators, fire alarm system, glass and electric work.



Figure 15: Map of Lahore and case study location (Source: Google Maps)

The project has different stakeholders, who include the client (Descon itself), architect, civil engineer, construction manager, contractor (Descon) and sub-contractor (electrical work, plumbing, Air conditioning, fire alarm and elevator etc.). Furthermore, site management also has supervisors, site foreman and workers. All these actors collectively influence the execution process at the construction site.

5.2.The roles and responsibilities of departments concerning Health, Safety and Environment at construction sites:

There are three legal departments regulating the construction industry in Punjab province (Pakistan). The first department is the Labour and Human Resource Department (deals health, safety and protection of labour rights issues), the second is the Environmental Protection department (deals with waste, water and air pollution) and the third one is Lahore Development Authority (LDA) dealing with registration of construction site. Key individuals from two departments (Labour and environment Department) were interviewed (Appendix 2) with a view to extract their views on health, safety and environmental risks at construction sites. These key interviewees are two inspectors (one from Labour department and other from Environment department) who inspect construction sites. The semi structured interviews was used, tape recorded and later transcribed.

The interview disclosed that the major tasks of the two departments are to ensure that regulations are complied with at construction sites and other industrial working places. They observe compliance through frequent examination of the work sites and encourage workplace HSE awareness through workshops and seminars. They also provide guidance on registering workplaces and examining the health of workers. These departments also issues guidelines and standards on HSE to improve implementation.

According to inspectors the worksite must be registered with Lahore Development Authority (LDA) before they conduct inspection. In the registration process contractors needs to provide necessary information such as location, type of project, architecture team and number of employees. The worksite needs to be inspected before the construction work commenced. However one of the hurdles faced by inspectors in the inspection process is that the contractors start their work without being inspected, hence sometimes didn't meet all the HSE requirements. When asked about whether Descon construction site had fulfilled the

requirements of registration, it was revealed that the site was registered with LDA, as one of the inspectors commented;

“Descon site is registered with LDA and has been inspected two times a year. There are no specific guidelines on how often inspection should be conducted; however it is essential that worksite should be inspected before the construction work starts”.

Concerning how inspection is carried out, they mentioned that site inspection is conducted randomly and without prior notice. Compliance papers are issued to those sites which complied with regulations and fines are imposed on those who are not complying, as one of the inspectors stated;

“During inspection we observe whether the worksite is register with LDA and whether they are complying with HSE measures, such as the provisions of Personal protective equipment (PPE), fall protection systems and other welfare facilities. If these requirements are not met, a show cause notice is issued or fined. We also distribute an accident register book in which contractors has to register all accidents on site and during the inspection we audit the book. We have visited Descon worksite two times and during one inspection we found that some workers were not wearing PPEs. The contractor was fined 100000 rupees”.

Another inspector commented;

“It is necessary for a contractor to conduct risk assessment and employ necessary control measures. There are no standard rules on how risk assessment should be conducted but there are some primary hazards on construction sites, such as electric shocks, falling from height, chemical materials and we have some professionals in our department who have good background in accident investigation”.

When asked about why accidents happen when there are control measures, one of the inspectors maintained that it is because of the carelessness of the site management and individual workers. Contractors wants to make maximum profits and sometimes don't provide necessary PPEs to the workers. Small scale contractors don't take risk assessment before the start of work; hence necessary steps are not taken to eliminate hazards on work site. Some contractors employ workers which have little or no apprenticeship training and these workers possibly may not be sensitised for their safety. Since most of their workers are not well educated and come from the informal sector where they may not go under any

regulation or union. The small contractors as compared to the large contractor don't want to spend their money, time and resources to certain standard of safety and health.

When asked about what problems is your department facing in monitoring routine HSE inspection at construction sites, one of the respondents explain the attitude of contractors as follows:

“As we know construction is unfortunately considered as the most hazardous professions you can get workers in, but when you inspect the construction site, they have already started construction work either out of ignorance of the regulations or simple their refusal to comply with the law. Since it is not like a factory or other industrial unit which have a constant place and you know the location, and it is there for several years. If they close the factory they will come and let you know whereas most of the contractors don't register their construction sites and by the time labour department is aware, it is near completion. This problem is more common with small contractors as compare to large construction contractors which mostly comply with rules and regulations. Often, we tried to inspect the site lay out and other HSE aspects before they start construction” (Informant- Punjab Labour and human resource department).

When asked about the strength of the department in maintaining routine inspection, their manpower or other necessary equipment concerning HSE monitoring on construction sites, one of the respondent explain this point as follows:

“Like many other departments in Pakistan, the Punjab labour and human resource department is also suffering from shortage of employees and constant budget cuts. Required funds related to official field trips, vehicle maintenance, utilities, office consumables and other expenditures are not released in full, hence making the desired outputs of the department difficult to achieve. As a result the performance of labour department has always been 10-15 percent below the planned number of inspections. Because of the restricted budget and employees constraints we concentrated our inspection activities to those construction projects where the risk of accidents is quite high and where the workers are in a great danger” (Informant- Punjab Labour and human resource department).

Another respondent from Environmental Protection Department mentioned:

“My department is lacking up to date instruments and the equipment available is inadequate in types and quantity to carry out several tests in relation to Occupational HSE standards. Furthermore many of the present equipment is either out of batteries or required replacement of the whole systems. We have several equipments like noise level meters, lux meters, watt meters, air sampler and heat stress measuring equipment. These are expensive meters and most of them are not available in the local market. The problem now is that we are running out of batteries and getting their spare parts is quite difficult. Even if we get the batteries, it is still difficult to adjust them and that is where the problem lies. Apart from instruments our department is also lacking competent technicians. The problem is more intensified by lack of vehicles and severely affects the mobility of inspectors.

When asked the respondents what measures you are taking to improve HSE conditions on the work site, respondent from Labour Department explained:

To improve HSE conditions on the construction sites it is necessary that a full scale campaign should be launched as most of the contractors and workers are ignorant of HSE issues. We have already launched some campaign programs (Jointly by Punjab Department of Labour and Human Resource & Environment Protection Department) assisted by the Centre for Improvement of Working Conditions and Environment (CIWCE). Labour department and environmental agency also launched various programs, short courses and workshops aimed at educating contractors, workers, clients and the general public to prevent the occurrences of accidents and to make sure that all people on construction sites are protected.

5.3.Descon Engineering System for HSE assessment, communication and control:

I have conducted interviews with Descon engineering Company with the sole purpose of understanding the attitude and behaviour of the leadership towards the HSE risk assessment and communication. The semi structure interview (Appendix 2) held with Naeem Ur Rashid Chouhan (Head of Human Resource Department, Descon) took half an hour and later transcribed. The major topic was the company’s policy, resource allocation and support given to the site management regarding HSE risk assessment and communication.

From the interview it was observed that the Descon Engineering Company has a HSE policy which states that

“We are committed for the safety of each employee as the major priority of this company. We will not compromise on an individual’s well being in anything we do. The enforcement of actions to help realize a healthy, injury free working conditions is the leadership responsibility”.

The company's policy statement mentions that it is committed to HSE risk management. On the question of how they will fulfil this commitment, it was revealed company has deployed one safety officers at the construction sites. The safety officers are working under site managers. It was also revealed that company provides all the necessary equipment for the site e.g. PPEs, safety belts, safety shoes, safe drinking water and a canteen.

On the question of whether the company has any specific method for HSE risk assessment and communication on construction sites, the respondent mentioned we don't have any specific method for risk assessment. However, the responsibility for HSE risk assessment is given to site managers who are supported by the safety officers. It is observed that HSE aspects on construction site are solely the responsibility of the site managers. This means that site managers must have good construction experience as well as full knowledge of HSE issues on worksite. It is the responsibility of the site managers to give training to the safety officers and later these safety officers are responsible to guide workers on related HSE issues. The respondent also mentioned that we recorded all the accidents which occur on site. We have first aid facilities on construction sites, as well as ambulances. He further mentioned that all our employees are covered with medical insurance if accidents happen.

When asked about communication between head office and site offices it was described that they have frequent meetings with site managers, visit the site offices and get everyday feedback through phone, Skype or face to face meetings.

On the question of what challenges your company is facing in implementing HSE policies, it was commented that lack of funds is the main issue faced by the company in implementing HSE risk assessment, communication and control. Head of human resource department further clarify this point by mentioning that they face strong competition, whereby the lowest evaluated tender is awarded the contract. Initially we put lower amount for HSE section before pricing the tender and later when tender is designed we recheck it again whether we can put more sum into this section or not. In most cases we can't put more amount for this section because of budget restriction, as he stated:

“Sometimes we have to spend more than our limits for HSE aspects because of strong competition and lowest price tendered, and so we can offer very little or nothing for the HSE provisions. As long as the area of competition excludes HSE aspects and the limited amount provided in the contract to deal with it, HSE condition will always be poor on most work sites because of the lack of funds in preventive measures”.

5.4. Focus group discussions with individuals on construction site:

The discussion was conducted with two groups of individuals at the construction site as indicated in the research design. For this part, discussion was focused on how HSE risks are established, evaluated, communicated and controlled at worksites.

5.4.1. Focus group one: Discussion with site management team:

Background:

The discussion revealed that the site manager was a very experienced person with 15 years of experience and having a civil engineering background with Master's degree in project management. He has worked as a site manager with different companies and on different building projects for 10 years in Pakistan. He manages all the activities on the site such a planning, coordinating and assisting the supervisors as he said;

“As a site manager I am pretty much occupied with planning, scheduling work and assisting different actors on the site. I am also responsible to ensure that all the work is done in a safe manner. To assist me I have a number of supervisors as well as a safety officer working with me. We have given certain duties to each group and my duty is to follow up and make sure that everybody is fulfilling their duty” (Muhammad Khawar-Descon Site manager).

He further mentioned that we don't have HSE committee on site. It's only me and safety officer who is having sole responsibility to make sure that everything is doing fine on construction site.

Regarding safety officer and supervisor, it was revealed that they were not highly educated. Safety officer have done Bachelor degree whereas the construction supervisor was having secondary school certificate (equivalent to O levels). Safety officer has also attended HSE courses offered by CIWCE. Both of them were experienced and having experience between 6 to 10 years on construction sites. Their duty was to organize the site where they work and also supervise the workers in their daily routines.

Knowledge:

During discussion we found that site manager was very knowledgeable on HSE risk management. As a site manager on different projects he was also a part of the HSE management, where he learns how to do risk assessment and communication and control on construction sites. As a site manager at Descon housing Project he has witnessed two

accidents in which one worker got disabled and the other lost his life. One of the accidents was falling from height and the injury by the equipment (concrete mixture). The site manager blamed the sub-contractor and the workers for the accidents, as he mentioned;

“I know that construction sites are very hazardous but we are trying our level best to keep it safe by following regulations. The company’s policy is to reduce the accidents on its sites. Nevertheless, we are facing some serious challenges as some of the workers don’t follow the safety rules such as not wearing PPEs and similarly some sub-contractors also don’t follow regulations. We are fined one time from the Department of labour and human resource because some of the workers were not wearing PPEs”.

Regarding the safety officer, his perception about HSE issues was high. He took some HSE courses from different institutes which were sponsored by his company. He mentioned that he is still learning about HSE issues from internet and have registered with internationally recognized bodies like OSHA and IOSH and are benefitting from monthly bulletins from these institutes. On the other hand construction supervisor was not very much aware of HSE issues and had never attended any HSE management course, but acquired some knowledge through safety meetings which held with site manager, workers and other supervisors.

How HSE issues are assessed:

From the discussion it was revealed that HSE management was coordinated by the site manager through safety officer. The safety officer works daily at the construction site to manage HSE risks, especially to assess and communicate them to the workers. The safety officer goes around the construction site every time to see if there are any potential hazards that could cause accidents. The hazards include open holes and sharp edges. When the hazard identified, it is duty of the safety officer to barricade it as a control measure (Appendix 3). The site manager works closely with the safety officer and provides all the necessary support that is required for managing HSE risks. On the other side, the role of construction supervisor was not having the responsibility of managing HSE risks on site, as there was a clear difference of duties. Construction supervisor is having the responsibility of supervising the working related quality and productivity, whereas safety officer works with workers to make it certain that they are following HSE rules and regulations.

Risk assessment and communication:

During discussion site manager mentioned that he carried out some sort of hazard identification. He identifies the hazards from daily activities, especially from working schedule. In addition, before the end of each working day he has meeting with construction supervisor to analyze the progress of the work and to design next day’s tasks. From the

activities, he spotted some sort of risk of falling from height and manual handling associated with important processes on site. His background has helped him to identify HSE risks and to provide control measures. Site manager further communicated these hazards with safety officer who further communicate those hazards and control measures to the workers.

Furthermore, safety officer mentioned that the main HSE communication method is safety meeting with workers which held twice a week. The major issue which we discuss in the meeting is to remind them that there are many hazards on the construction site. I encourage them to wear appropriate PPEs all the time, keeping the site clean and report all onsite accidents. He added that we also put posters, signs and symbols on the site so that workers can easily understand them and do their work safely (Appendix 3). Safety officer further stated that if the worker got injured by his own fault, even though he was provided PPEs and he didn't wear it, the company will not held responsible for this. Similarly if we find that somebody is not following HSE regulation, he will given a written warning and if he gets these warnings more than three times, he will be dismissed from the site.

In addition, safety officer also have the responsibility to keep all the documentation regarding HSE hazards and to present it to the government safety inspectors or employers. These documents also contain an accident register book, in which we register all the accidents that happen on the site. In case of severe accident I have the responsibility to report it immediately to site manager and to the Government Labour Department.

During discussion another very important point was raised by the safety officer that low education and poverty among workers is the one of the major causes of accidents on the sites. Due to the lack of education they sometimes don't understand what the safety officer has communicated to them. Since with low level of education they don't have enough job opportunities, therefore once they get a job they are scared of asking for their rights. Among them some workers got a lot of experience and certain that they know everything about how to work safely. Sometimes they refuse to listen to safety officer and believe that safety is not for their own benefit but for the company's benefit.

5.4.2. Focus group Two: Discussion with Workers

A focus group discussion was conducted with workers from three groups at the Descon housing site. The reason to choose these three groups was that all of them were directly exposed to height and manual handling risks. These workers were from scaffold erecting, steel enforcement and concrete mixture areas.

Discussion about their work:**Scaffold erection group:**

This group consisted of 6 workers and regarded as at most risk of falling. During discussion (2 scaffold workers) they mentioned that scaffold workers are required to have knowledge of HSE issues and to do some calculations to see if the scaffolding will hold. They do variety of tasks on site which include connecting, bolting, assembling building hoists and assembling and disassembling steel columns. They mentioned that although we use mechanical aids to do these heavy work tasks; but there are many other tasks which we do manually.

Concrete work:

This group consisted of 18 workers and they are involved in mixing and transportation of concrete to the points such as walls, roof and compacting concrete. They also mentioned that in this field every worker should be physically fit because the tasks like pulling and pushing concrete using wheelbarrows and lifting heavy loads manually such as cement bags demands extra strength.

Reinforcement steel group:

This group involved 8 workers and they position and secure steel bars and rods. They also fasten rods according to the blueprint by using wire and pliers. They spend a lot of time bending at top of the roof and handle it manually as they work with sharp equipment.

Discussion about workers' education, experience and perception of HSE risks:

During discussion it was revealed that none of the worker (6 in case study) was having good education background and all of them were having primary education. They all were having experience of more than 5 years and they never got any professional training in how to do construction tasks like scaffold erection, reinforcement work and concrete casting. They mentioned that they acquired their skills informally by working on construction sites as an assistant to a senior person until they become experienced.

During discussion when I asked about their perceptions about HSE risks associated with their tasks, the workers explained that they never got any formal training about HSE issues but had received it informally at the site safety meetings and from there we got knowledge regarding risks associated with our daily tasks. The concrete respondent cited chemicals and muscle pain is their major risks, the scaffolding respondents said falling from height as their main risk and the steel reinforcement respondents mentioned back pain, falling and sharp cuts. The workers have witnessed some of the accidents as one member of the scaffold team mentioned;

“We know this is one of the most difficult and dangerous jobs on construction sites as I see my co-worker falling from a height and died. It was a great tragedy for us. Now, we are very cautious when we erect scaffolding, especially at height. As a team we help each other and if we see someone is not wearing necessary PPEs properly we remind him and try to help him in putting safety harness properly”.

Communication and cooperation among safety officer/supervisors and workers:

During the discussion when asked about how they perceive the communication and cooperation of the safety officer/supervisors, the scaffolding workers mentioned that they have good cooperation from supervisors and the safety officer. On the other hand concrete and steel reinforcement workers mentioned that they are well communicated and informed by the safety officer regarding HSE issues, but they complained that their supervisors is demanding a lot. Sometimes we are frightened to talk to our supervisors if we have any family problem or any other concerning issue which could hinder our working performance. There were situations when some accidents happen because the co-workers' mind was somewhere else while working. And we know that a small mistake in our work can be fatal. Therefore it is very important that supervisors and safety officers must maintain a close relationship with workers so that we don't hesitate to discuss our problems with them, which will eventually result in better performance.

Why workers don't wear PPEs even if they are provided:

The scaffolding workers revealed that they all have necessary PPEs such as safety shoes, safety hats and safety belts. On the other hand concrete workers were having different view. Some of them were having a complete set of PPEs whereas some were having only hard hats. When we asked supervisors for PPEs, we are told there is none. The Same situation was revealed by the steel enforcement workers and claimed that there is not enough PPEs on worksite.

During discussion when I asked these workers that some of you have been provided complete PPEs on site but then why some of you (according to safety officer) don't wear it? The respondents mentioned that sometimes it makes them feel uncomfortable while working and sometimes it is difficult to find the exact size of safety shoes which forces us to wear large ones, making us uncomfortable. The steel enforcement workers commented that wearing safety gloves actually slow the pace of work which is not bearable for supervisor who required maximum output from workers. Another cause discussed by the workers for not wearing appropriate PPEs on site was the weather. Lahore is very hot area and average temperature during summer goes to 45°C. Therefore, wearing sometimes PPEs such as

gloves, boots and hard hats by concrete workers and steel enforcement workers affected their working performance. They mentioned that most of the time they work on top roofs where they are extremely exposed to the direct sun.

5.5.Environmental issues on Descon housing project site:

Waste management and housekeeping issues:

As we know that when construction process is in process, a lot of construction waste is produced. When I asked the respondents about the waste management processes at construction site, the safety officer mentioned that we have good system of waste management. Each day it is the responsibility of workers to put the waste material in a corner of the site. When asked this question from workers they mentioned that yes it is our responsibility to put waste material on a specified place but sometimes we don't get time to deliver waste on an allocated place because there are so many other things to do before we finish our duty. From the site visit I personally noticed that there was no proper arrangement of waste disposal and there were no dustbins and containers for construction waste. Heaps of broken pieces of slab, wooden material, bricks and metal were present in the open ground. Aside from waste management the site was also not very tidy and clean. There was so much waste water present on the construction ground and there was no machinery to remove this water and workers were trying to remove water manually at their own level. In construction industry it is said that keeping the site area cleared from all unnecessary waste materials is a first-line of defense against all accidents and injuries. From author's personal observation it is emerged that Site management showed negligence on this part and didn't take strict actions to tackle the issue.

Dust issues on site:

Dust is also an also a major construction waste which can effect workers' health and productivity. The activities contributing dusts are concrete mixing, grinding, excavation and brick work. From the site it was observed that there was no proper system for dust collection. It was observed that workers were not provided facemasks and some workers complained respiratory problems. When discussed with safety officer, he revealed that we don't have budget for all required PPEs. We use limited budget to buy most important safety material like safety boots, safety belts and hard hats. Workers mentioned that they try to control dust at their own level by utilizing methods like sprinkling.

Illumination issues on construction site:

Proper illumination is also an important part of working environment because improper lighting can be a major cause of many hazards like falls, slips, trips and eyestrains. Proper lighting is more important in the activities such as concrete pouring and working at height. When there is situation when workers required working for long hours in the darkness, it is the responsibility of supervisor/safety officer to ensure that all necessary elements like illumination and other precautions are in place. To check whether Descon management has provided adequate illumination facilities for workers, I utilized Lux meter to observe actual level of illumination in different construction activities.

Table 2: Measured light levels for different activities (Kilo Foot-candles)

Activities	Light levels in foot candles (Kfc)			Standard in Kfc	Results
	Min.	Max.	Normal		
Formwork	0.33	1.96	1.85	0.005	N.S
Site office	0.02	0.03	0.02	0.03	N.S
Stairs	0.0018	0.002	0.0019	0.01	S
Grinding	0.0225	0.0304	0.0225	0.005	N.S
Concrete mixing	1.48	1.72	1.56	0.003	N.S

*N.S: Non significant, not causing significant bad impacts, *S: Significant, may cause adverse impacts.

Source: (Reynolds and Randle, 2002)

I took all the values during daylight and the result show that there was proper light at the site during day time (night time situation can be different). The situation was satisfactory during the day on all construction activities except stairs where proper illumination was not present.

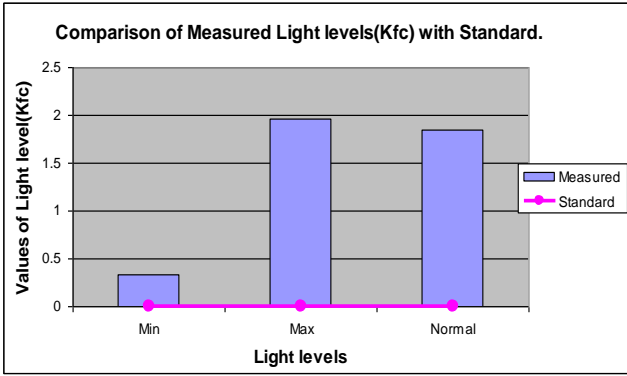


Figure 16: measured Light Levels on from work

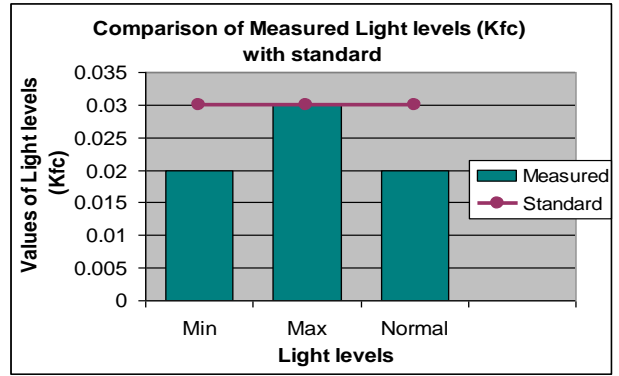


Figure 17: measured light level in site office

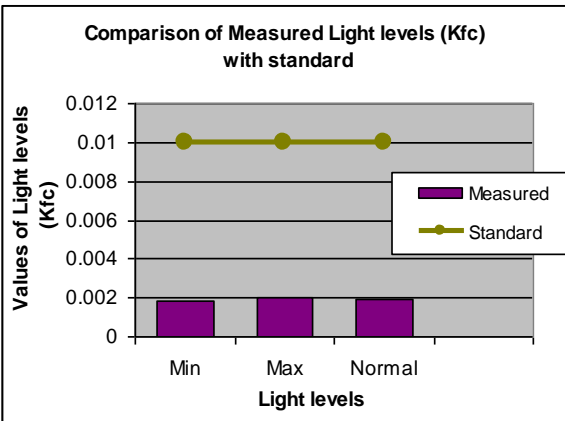


Figure 18: Measured light levels on stairs

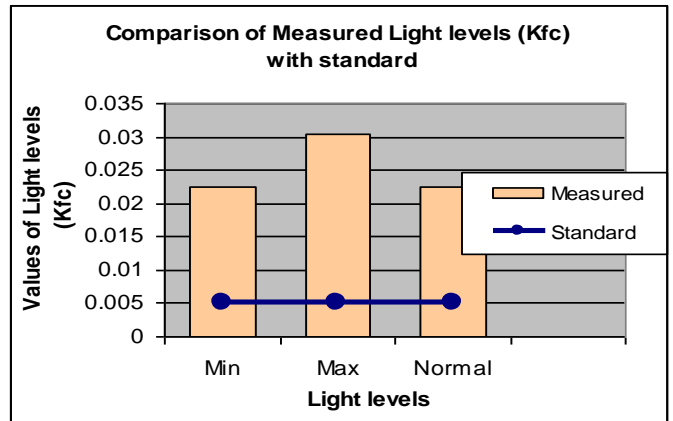


Figure 19: Measured light levels during grinding

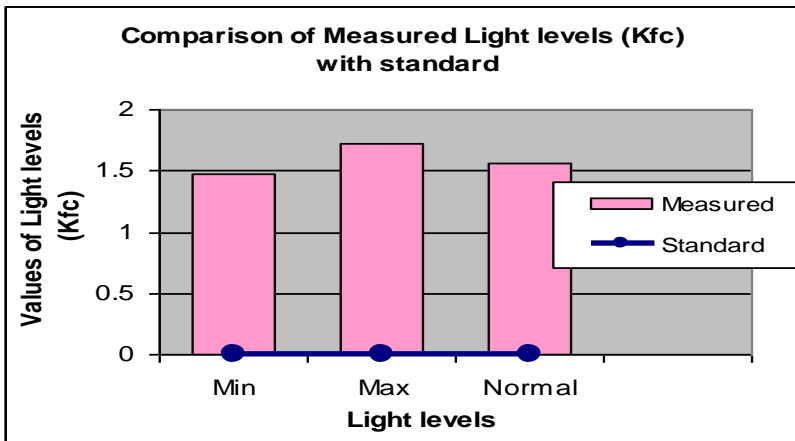


Figure 20: Measured light levels on concrete mixing

Noise issues at construction site:

Noise is an unwanted sound which at certain volume may cause irreparable damage to hearing. Author observes that some of the activities were producing high level of noise. But few of the activities were well under normal noise level. The readings were taken by author (by using noise meter) from two equipments (Winch machine, Mixer machine) and all other floors of the building to check noise level against standard value.

It was observed that winch and mixer machine was producing more noise than standard level (80-95 dB (A)). It was also measured that noise level was under standard value in basement, 4th and 5th floor, whereas on ground floor, 1st, 2nd and 3rd floor it exceeds the standard value of 90dB(A).

Table 3: Measured Noise level of Different Equipments

Equipment	Noise level in dB (A)		Standards In dB (A)	If exceed standards
	Min. level	Max. level		
Winch machine	125	135	80-95	Yes
Mixer machine	123	132	80-95	Yes

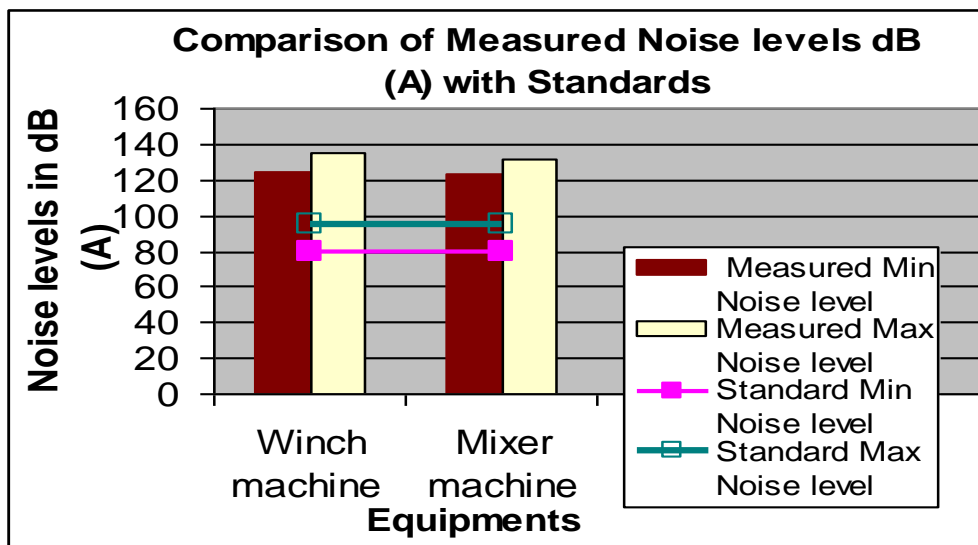


Figure 21: Measured noise levels of different equipments using Noise meter against standard

Table 4: Measure Noise level at different floors

Areas	Noise level in dB (A)		Standards In dB (A)	If exceed standards
	Min. level	Max. level		
Basement	69.7	110	90	No
Ground floor	112	123	90	Yes
1 st Floor	93.5	121	90	Yes
2 nd Floor	80.0	111	90	yes
3 rd Floor	83.2	106.5	90	Yes
4 th Floor	74.0	104.7	90	No
5 th Floor	66.1	76.0	90	No

Source: OSHA (n.a.)

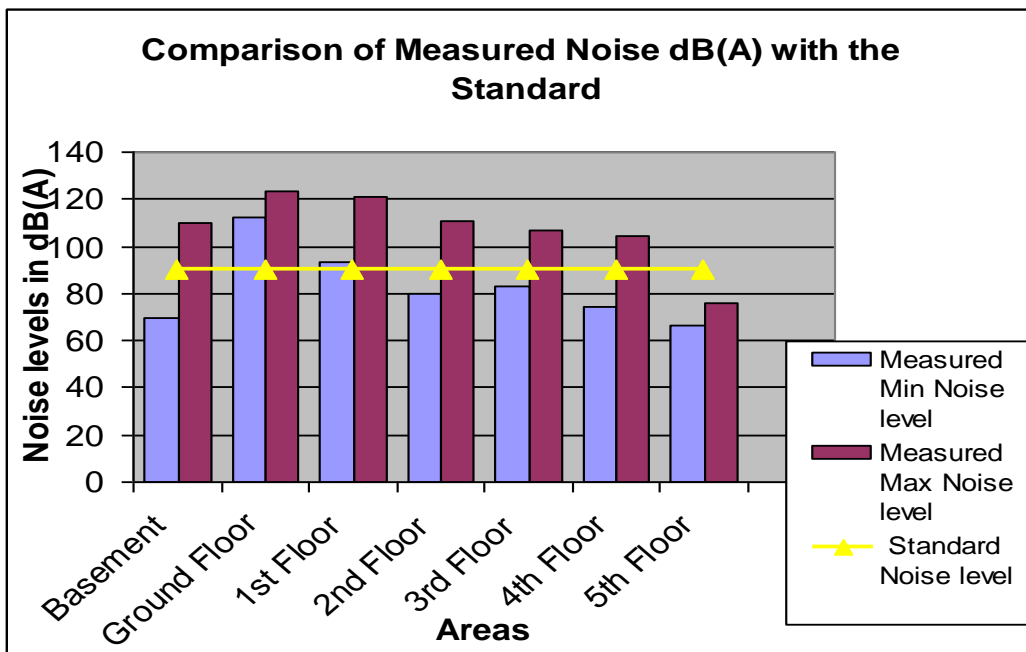


Figure 22: Measured noise levels at different areas using Noise meter against standard

6. Conclusion:

The results from different research approaches are combined and show the real landscape of risk assessment on Pakistani construction sites. From the pilot and case study we observed that falling from height was the major incident which workers face on construction sites and this needs be addressed properly during construction projects. This study also revealed that department of labour and human resource and department of environmental protection agency was unable to enforce HSE laws, rules and regulation because they were not having enough resources and personnel to carry out necessary inspections of construction projects. Therefore, it is the responsibility of the government to provide them necessary resources and expert professionals to carry out their daily inspection to monitor construction sites.

It is also explored that there was not much trend of safety on construction sites and no emphasis was laid on safety against major courses of accidents, first aid, PPEs, accident reporting mechanism and housekeeping. Only few companies were complying with necessary health and safety regulations and most of these were multinational. The most of the local companies stated that they are not having resources to maintain health and safety at construction sites. Therefore it is the responsibility of the Government to make necessary arrangements/regulations for all employees of the construction companies to undergo HSE training to create safety awareness at all levels and companies should provide sufficient funds for this purpose.

The case study revealed that the site manager and safety officer was using checklist to assess risk and safety officer was using different methods (e.g. safety meeting, posters and signs) to communicate with workers and providing all necessary PPEs but workers were not complying with this and some of them were working without PPEs. The pilot study and case study both revealed that low level of education of workers is also a big issue in making them to understand and educate. Due to this they don't understand the instructions and guidelines. Therefore, it is the responsibility of the companies to provide some form of formal/informal education for the workers on site and this could be linked with incentives when it's complete. Furthermore, case study also revealed that there was no waste management system and there were noise and illumination issues.

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Appendix 1

Quantitative survey Questions for Pilot study

1. Name of construction where you work.....
2. Job title.....
3. Education Background:
Primary Education Secondary Education College University
4. Do you have information about Health, Safety and Environmental aspects on workplace.
Yes No Don't Know
5. If yes where did you get information?
From study from organization training by company my co-workers my Manager
6. In your opinion what are the main types of accidents on work place.
Fall from height struck by machinery caught in between the plants or confined space
Electric shock other (poisonous Gas, lack of oxygen, fire)
7. Is your company following government's construction safety laws, rules and regulations
Never seldom sometimes often Almost Always Not applicable
8. Is your construction company following safety management plans(e.g. safety training plans, safety policies, safety inspection program and safety audits).
Never seldom sometimes often Almost Always Not applicable
9. Is your company providing enough resources to safeguard against possible accidents
Never seldom sometimes often Almost Always Not applicable
10. Are workers following any safety instructions or plans under guidance or on their own?
Never seldom sometimes often Almost Always Not applicable
11. Do you have (or observed) any waste and environmental management plan on your construction site
Never seldom sometimes often Almost Always Not applicable
12. Do you have any provisions of first aid on the construction site?
Never seldom sometimes often Almost Always Not applicable
13. Do you have provisions of Personal Protective Equipment (PPE) on project site
Never seldom sometimes often Almost Always Not applicable
14. Is there any accident reporting mechanism on site to supervisors and safety officers?
Never seldom sometimes often Almost Always Not applicable

Appendix 2

***Question for Pilot interviews with senior management staff of companies (Pilot study)**

1. What is your designation and how long have you been working in this company and overall in the construction industry?
2. Do you have policy/regulations regarding HSE?
3. Does your company provide HSE training to employees?
4. Do you have HSE committee?
5. Are all worksite accidents recorded?
6. Are all employees of your company insured against accidents?
7. Do you think under reporting is major problem in Pakistani construction industry?

Interview questions for institutional legal system (Department of labour and Environment)

1. What is your role in ensuring HSE is managed on construction sites
2. How do you doing inspection
3. What are challenges your department are facing
4. What are your departments doing to improve situation

Interview questions for Organisation system (Descon Head of department (Human Resource))

1. Does your firm have a health and safety regulations/policy and how does it state.
2. How does your company manage HSE risks on the sites?
3. What are the challenges your company is facing in managing HSE management
4. What are your suggestions on improving HSE risk management?

Questions for Focus Group discussion with management staff and workers (case study)

1. What your Education and background?
2. How much experience do you have in construction industry?
3. Where from you learn to perform construction activities?
4. Do you have any training/education of HSE risk in construction sites?
5. Are you involved in risk assessment and what methods you use for risk assessment?
6. Are you involved in risk communication with workers/employees and what methods you use for communication and what messages are communicated?
7. In what way you are involved in risk control and what tools you used for risk control?
8. What are the challenges/obstacles on managing HSE risks?

***Sample pilot interview one:**

1). Interview with a construction engineer in a construction company

Question: What is your designation and how long have you been working in this company and overall in the construction industry?

Answer: I am a construction engineer and I am working in this company for the last 4 years and overall I have 20 years experience in this industry.

Question: Are you involved in HSE decision making in your company?

Answer: I have the following duties: communication with clients and contractors; making schedule for construction site and prepare site reports. But I also have an extra duty to keep an eye on HSE issues on site.

Question: Does your company have policy/regulations regarding HSE in your company?

Answer: Frankly speaking we don't have any policy or regulations regarding HSE.

Question: Does your company have a health and safety committee?

Answer: No we don't have any.

Question: Are all worksite accidents recorded?

Answer: Yes, we try to keep all the records. But I can't guarantee that everything is reported.

Question: Are all employees of your company insured against accidents?

Answer: workers are not insured against accidents. Its only management staff which covered by insurance.

Question: Do you think under reporting is major problem in Pakistani construction industry?

Answer: Yes indeed. There is a cultural issue in Pakistan that people don't take HSE matters sincerely and accidents happen on sites routinely and we can't blame the entire system for this.

***Sample Pilot interview two:**

1). Interview with Project manager in a construction company

Question: What is your designation and how long have you been working in this company and overall in the construction industry?

Answer: I am working as a Project manager in this company for the last 7 years and I have 10 years of experience in the construction industry.

Question: Are you involved in HSE decision making in your company?

Answer: Yes I am but not in full capacity. My responsibilities include that all assignments undertaken on site are safe for employees. I also give instructions to the supervisors/foramens that everything is checked.

Question: Does your company have policy/regulations regarding HSE in your company?

Answer: Yes we have.

Question: Does your company have a health and safety committee?

Answer: yes I think it has but I am not aware of it

Question: Are all worksite accidents recorded?

Answer: if anything happen on site I report it to boss.

Question: Are all employees of your company insured against accidents?

Answer: Our employees are not ensured against any accidents.

Question: Do you think under reporting is major problem in Pakistani construction industry?

Answer: I think yes. Accidents are always reported.

Appendix 3 (Case Study)



Concrete pouring on top floor of the building



construction manager discussion with supervisor



Installation of reinforcement to shear walls and columns



Slab casting at the basement level



Ambulance was present at the site



Presence of First aid box on site



Unprotected stairs can cause slips



Presence of water on floors can cause accidents



hazard can occur on site



soft and hard barricated is in place to prevent fall hazards



workers are provided with safety belts and helmets



workers also provided safety boots



Unprotected electric connection can set fire



Fire extinguisher was present at the site



sign of danger was present at high voltage of electric panel



Instruction about wearing PPEs on site



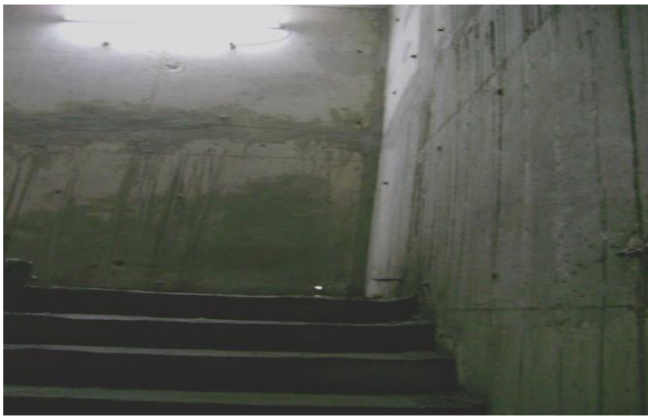
Presence of hard waste in the basement



Improper soft/solid waste management on construction site



Workers removing water at their own level wash basin on construction site is in poor condition



Proper illumination is important on the places like stairs



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