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# Occupational Health and Safety in Construction Projects

Masoud Afzini, & Behnam Neyestani

## ABSTRACT

*As recent events have continued to confirm, construction disasters upset and negate hard-won development gains. Construction hazards are increasing, and as awareness grows, these hazards have become a major cause for concern worldwide. The fact that construction mishaps are often the results of multiple, interrelated causes, which means that the societies have difficulties in addressing this global issues. With the current scenarios stated above, this study aims to identify ways to observe safety principles for reducing hazards in the workplace, particularly building projects in Iran. Thus, this research used descriptive methods to identify the benefits of safety and health in construction projects in Iran. The results indicated the level of the implementation of safety programs, and usefulness of them in construction projects in Iran*

**Keywords:** *Construction Projects; Danger; Hazard; Accident; Safety, and Health.*

## Introduction

Safety is the science that helps people prevent accidents at work and always toward the preservation and protection of labour and capital takes a step. Safety is basically a string of measures to set principles and rules are being told that using them can be labour and capital against the various risks in industrial environments such as effective and efficient maintenance and thereby a safe and healthy work environment created staff efficiency .safety is defined as the degree of risk away from the term (Hazard) that is a scientific definition of safety the circumstances that bring potential harm to personnel , equipment and buildings , eliminating or reducing the materials

performance in the execution of a task is predetermined. When (Hazard) there is a possibility there will be negative effects mentioned.

Word (Danger) indicates exposure to a (Hazard) is just the opposite of immunity (Danger) has been, and sought to eliminate potential hazards in the workplace is available. There are not hundred percent safety and belonging, and virtually never be the reason of this is that safety is partial protection against the risks.

Construction industry is one of the most employment-generating industries therefore, attention to matters of occupational health and safety of workers and employees in these important .since construction activities are very diverse and complex, these activities can be observed at risk. Therefore, the effects and consequences of non-compliance events for event safety and interest groups would be costly and sometimes irrecoverable.

## **1.1 Background of the Problem**

Since a construction accident can enter the economic and social damage to individuals and to society , this result causes of construction accidents , financial and human resources part of the community are to maintain economic production factors and the pressures and psychological distress injured workers and their families and society would prevent . Thus, although a good understanding of the extent and pattern of accidents in the construction industry in the world but there is a brief review of the full range of management factors and individual workshop.

Excavation of the principles in construction projects in Iran is one of the biggest challenges in construction. So many workers are killed each year in this type of events.

- In Tehran, not comply with the technical principles of the three workers were killed in excavated. Fire fighters were observed at the site after the excavation is usually part of the wall for a building area of 250 square meters on three workers have been taken down . They incorporate the safety and rescue equipment , and removing dirt and stones thrown by the workers , three of them came out of under the rubble and to treat and transport emergency relief was provided to health centre.
- In Tabriz, collapse a building construction 5 workers are trapped under rubble.

- In Tehran , a worker engaged in welding skeleton that was a 5-storey building fell down and killed due to lack of safety equipment.

One of the important issues in construction demolition and excavation is usually when it is appropriate to establish the principles of sustainability. Some buildings are destroyed adjacent structures construction Guardian.

According to ILO statistics , 17 percent of incident deadly in construction occur while the number in according to Iran s deputy minister of Labor and Social Affairs of 46% , this number is very worrying. Similarly, there were many scenarios regarding the deaths of workers in construction accidents from other countries, as follows:

- Construction work is the most dangerous in Europe. Fatal accident rate is approximately 13 cases per 100.000 population.
- In the same year the construction industry was experience non-fatal injury rate of 7.9 per 100 full-time workers.
- About 6 percent of American workers are working in the construction industry, but about 20 percent of them have been injured.
- Hong Kong also has the highest mortality rate of construction. Although the accident rate of 350 per 1000 in 1980 to 60 cases per 1000 people in 2007 and the rate of construction accidents is 20 percent .

Integral part of the construction–safety– the result of considerable interest to the researcher for a valuable step in their careers and industry. Researchers continued interest in construction safety since they cost more than doing their job as representatives of the owner of the site where they have been exposed to construction hazards.

## **1.2 Statement of the Problem**

The study aims to find out factors that cause hazard and ways to reduce hazard in construction projects of workers. Specifically it will answer the following questions:

- 1- What is the demographic profile of respondents?
- 2- What are the factors causing hazards faced by respondents?
- 3- What are the identify ways to reduce hazards faced by respondents construction workers?

### **1.3 Significance of the Study**

The study will benefit the by:

- 1- Construction workers: awareness of hazards will alert workers to observe safety rules in construction site.
- 2- Owner: reduced hazards will save them money. Cost of accidents is high.
- 3- Contractor: also reduced hazards will save contractors money because they should pay the cost of treatment of workers from their own profit so it is importance for contractors that save their workers.
- 4- To provide opportunities for continuous improvement throughout the project life cycle.
- 5- To provide a simple tool that acts as an incentive for workers.

### **1.4 Scope and Delimitation**

This research was limited on public projects that have started since Jan 2010 to now. This research will limit to information obtained from the workers who works in high rise building in Iran.

### **1.5 Operational Definition of the Variables**

- **Reduce hazards:** this is including all of safety programs that they can help us for reduction hazards.
- **Hazards:** hazards include all bad accidents and dangerous are that happens in construction site. That these aren't good for workers, owner and contractor.

- **Safety Program:** refers to a set of detailed rule that shall cover the processes and practices utilized in a specific construction project site. In this study it is composed of both corporate and site program, as was show in a framework discussed in chapter 2.
- **Construction project site:** means the place or venue that a project, such as a building, is being constructed. It is usually temporarily fenced or barricaded for safety purposes and information of the operation.
- **Construction safety :** means the condition or state of being protected from or unlikely to cause danger, or risk at the construction involving constructions people, machine or equipment, management, method and environment or project site (as defined above)
- **Practices:** means the actual application or use of an idea, belief or method as opposed to theories about such application or use.

## 2. THEORETICAL FRAMEWORK

Construction industry is one of the most important and most jobs are among the industries in the Iran. Therefore the issues of occupational safety and health of workers and employees in this is important and since construction activities are very diverse and complex , the risk of these activities can be seen and therefore the effects and consequences of event safety and interest groups would be very costly and sometimes irreversible, since the events of economic and social structural damage on the individual and the community. The result is that income from construction accidents are part of the human and financial resources to maintain community and pressure and discomfort of labor and harmful psychological effects resulting from accidents in the community will prevent.

The study was seeking a range of factors to explain the processes involved in construction accident causal factor in accidents, including policy, management and individual workshop. Lack of monitoring of workers employed by the employer, allocate labor, lacks the necessary skills, negligence is the most important factors in construction accidents in the workplace. The most important way to reduce accidents in building

construction project is having a strong safety program. Occupational Safety and Health Administration (OSHA) is responsible for developing safety programs. Strong safety program is a firm basis for site safety programs. A good safety program can be effective over time. It should be continuous feedback from the sites related to critical areas for training and have any ideas about prevention methods. The site program specifically explains the work that must be done at the site both before the project starts and during construction itself. A successful safety program should be working on workplace, working conditions, eliminate risk and focus on personal protection. Safety programs that are intended for construction projects are divided into categories:

1- Organizational programs include :

- Training for new forces, new laws and regulations and educational workshops.
- Inspection and enforcement, safety committee, disciplinary warnings and safety programs through audit.

2- Site programs include:

- Having identified risks and warning signs and protection from fire.
- Personal protective equipment including Boots, Safety Shoes, Eye protection, Fall restraints, Safety Belt and etc.
- Fall protection include Safety Nets, Guardrails, Controlled access zones

Safety in the context of civil engineering is the discipline of preserving the health of those who build, operate, maintain and demolish engineering workers and of others affected by those works. Safety is defined as the freedom from danger of risk. This can apply equally to the danger of physical injury and to the risk of damage to health over a period of time. Accidents that occur during construction and demolition activities result injury, mostly, but not invariably to employees on the sites. Accidents can occur even before works begin, during survey and investigatory phases of a project, and they can also occur after the works have been completed because of faulty design or construction, causing death or injury to those engaged on maintenance work and to member of the public.

### **3. METHODOLOGY**

#### **3.1 Method of research**

First, the study selected three government projects in Iran for our research and then we go to office projects and take a letter for entrance to projects. All personals that they worked in the projects were one hundred forty five people. The study was selected twenty percent of the workers to respond to questionnaires. This selection is done randomly. In this research, we choose our entire question about programs safety and health for reduction hazards in construction site. Thus, this research prepared a questionnaire and then gone to the project sites and the questionnaires were completed by workers. The main methods for this research are namely:

- 1- Investigating workers in workplace, first the study examined the workplace of nearly all our workers and the working conditions and how he and his position .workers are working at height are at higher risk.
- 2- Warning signs in project: Warning signs on all construction projects should be seen and easily available throughout the workshop so that if someone from outside to enter the workshop is the first thing that sees the warning signs.
- 3- Evaluation and equipment required for the protection and safety of workers in the workplace. Project manager should be the number of devices needed for safety and health of workers and workers in the workplace is to prepare workers to be employed safety.
- 4- Investigating number of workers in the high work rate and their use of safety devices.
- 5- Investigating workers at work on the ground but the direction in danger all construction workers are working in the workshop is at risk.

#### **3.2 The respondents**

This section explains how we find respondents. In this part of our respondents are selected based on their work. The respondents are those who directly are associated with

high-risk tasks and observe safety and health is a priority for them. The respondents were selected at random and questionnaires distributed among them.

### **3.3 The locality of study**

Due to recent progress in the construction industry and create new methods caused a lot of hazard for workers. Over the past events in Iran, the study realized that the most accidents are due to human errors. most of these accidents were related to the adequate information on safety and not using safety equipment and personal protection and is not healthy enough to work at height .so we sent a representative to the project to fill locations of risk and dialogue with workers and company personnel to identify hazardous locations and know how much workers are aware of safety and personal protective equipment and how much of their use in the workplace.

### **3.4 Instrumentation**

In this section we use a tool that we named questioner. These questions are important tools used in personal safety have been used. These questions were by the person directly in the projects are asked. These were asked by the person directly in the projects are asked. The questioner is included two sections. Part one is demographics survey questionnaire and part two is direction .These are questions that are most basic and most advanced about safety questions.

### **3.5 Data analysis**

The data was analyzed based on descriptive statistics, the designed questionnaire could let the respondents give their responses corresponding their personal experiences and opinions, to the different variables by point Likert scale. The results of the questionnaires being analyzed in this study by using SPSS Version 17 software. So, SPSS by several statistical techniques were employed to measure and analyze the level of importance of the factors, and mean comparison in this study.

## **4. DATA ANALYSIS**

This chapter deals with the presentation, analysis and interpretation of data.

**Problem 1. What is the socio-demographic profile of the respondents in terms gender, age, type of work, civil status, education and job type?**

Table 1 presents the profile of the respondents in terms of gender. Table 1 is also reported that all construction workers in Iran are males. There are a total number of 30 respondents or 100% of the respondents that are male. So, there is no any women respondent.

**Table 1**  
**Respondents in Terms of Gender**

<b>Gender</b>	<b>frequency (f)</b>	<b>percentage (%)</b>	<b>Rank (R)</b>
Male	30	100%	1
Female	0	0%	2
<b>Total (x)</b>	<b>30</b>	<b>100%</b>	

Table 2 shows that 22 persons or 73.34% of workers working full-time, and 8 persons or 26.66% of workers were part-time.

**Table 2**  
**Respondents in Terms type of worker**

<b>Type work</b>	<b>frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Full-time	22	73.33%	1
Part- time	8	26.67%	2
<b>Total (x)</b>	<b>30</b>	<b>100%</b>	

Therefore, there were 22 respondents work full-time with 73.33 percent and 8 persons have worked part-time with 26.67 percent.

Table 3 is related to the experiences of the workers. The total number of 30 respondents to question no.4, 12 persons 40 % of workers have worked for 1 year but less than 3 years with and then 9 persons 30% of workers have worked for 3 years or but less than 5 years and 5 persons 16.66 percent of 30 respondents have worked for Less than 1 year, and the last 4 persons 13.34% of workers have worked for 5 years but less than 8 years with of respondents. This table shows us that most workers, work in this projects for the time period between 1-3 years, because most our project will finish before three years.

**Table 3**  
**Respondents in Terms of how long do you work**

<b>How long do you work</b>	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank(R)</b>
Less than 1 year	5	16.66	3
1 year but less than 3 years	12	40	1
3 years but less than 5 years	9	30	2
5 years but less than 8 years	4	13.34	4
<b>Total (x)</b>	30	100%	

Table 4 presents the profile of the respondents in terms of civil status. The married respondents have the frequency of 22 or 73.34 percent which ranked first, while single respondents have a frequency of 8 or 26.66 percent. So, it can be concluded that majority of the respondents are married.

**Table 4**

**Respondents in Terms of Civil Status**

<b>Civil Status</b>	<b>frequency (f)</b>	<b>percentage (%)</b>	<b>Rank (R)</b>
Single	8	26.66%	2
Married	22	73.34%	1
<b>Total (x)</b>	<b>30</b>	<b>100%</b>	

In terms of education, Table 5 indicated that majority of workers that work in construction site are with elementary education. Responding to questions from 30 individuals, 12 person or 40% of workers have basic education and 9 persons or 30% of workers have high school diploma and others or 30% of workers were vocational degrees as well. This table also revealed that the most of involved workers in construction sites with low education levels.

**Table 5**

**Respondents in Terms of education**

<b>Education</b>	<b>frequency (f)</b>	<b>percentage (%)</b>	<b>Rank (R)</b>
Elementary	12	40	1
High school	9	30	2
Vocational	9	30	2
<b>Total (x)</b>	<b>30</b>	<b>100</b>	

From Table 6, it was observed that the most of the workers working in construction site were concrete (11) workers and welder workers (7) respectively.

**Table 6**

**Respondents in Terms of job type**

<b>Your job type</b>	<b>frequency (f)</b>	<b>percentage (%)</b>	<b>Rank (R)</b>
welding	7	23.33	2
concrete	11	36.67	1
structural	3	10	4
Frame work	4	13.33	3
painting	2	6.67	5
Others	3	10	4
<b>Total (x)</b>	<b>30</b>	<b>100%</b>	

There are 11 persons or 36.67% of workers have worked in concrete section and 7 persons or 23.33 % of workers have worked in welding section and 4 persons or 13.33% of workers have worked in frame work section and 3 persons or 10% of workers have worked in structural section and 3 persons or 10% of workers have worked in others section too and 2 persons or 6.67% of workers have worked in painting.

**Problem 2. What are the factors causing hazards faced by respondents?**

The following table shows that 9 persons or 30% of the workers chose never and 8 persons or 26.66% of workers chose always and 7 persons or 23.33% of workers chose almost and 6 persons or 20% of workers chose seldom. In this part, the result revealed that the most workers are aware that the use of cell phone when they are working could be one of the factors for hazard.

**Table 7**

**Do you use cell phone while you are working at the site?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	8	26.66	2
Almost	7	23.33	3
Seldom	6	20	4
Never	9	30	1
<b>Total (x)</b>	30	100%	

From Table 8, 8 persons or 26.66% of worker chose always and almost respectively, while 7 persons or 23.33% of the workers chose seldom and never respectively. Thus, this part give enough evidence that the most workers don't have aware about this issue of the hazard, however these places can be hazardous. It can be a point for training to workers for reduction of hazard.

**Table 8**

**Do you walk through dangerous and unfinished sites?**

	<b>Frequency(f)</b>	<b>Percentage(%)</b>	<b>Rank(R)</b>
Always	8	26.66	1
Almost	8	26.66	1
Seldom	7	23.33	2
Never	7	23.33	2
<b>Total (x)</b>	30	100%	

In Table 9, 13 persons or 43.33% of worker chose almost and 8 persons or 26.66% of the workers chose never and 7 persons or 23.34% of the workers chose seldom and also 2 persons or 6.67% of workers chose always. In this table we can see that the most of workers don't have enough information about electrical hazard. This is an important factor to make hazard.

**Table 9**

**Do you troubleshoot an electrical hazard?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	2	6.67	1
Almost	13	43.33	2
Seldom	7	23.34	4
Never	8	26.66	3
<b>Total (x)</b>	30	100%	

In Table 10, 12 persons or 40% of workers chose no 4 and 11 persons or 36.67% of the workers chose no:2 and 4 persons or 13.33% of the workers chose always and also 3 persons or 10% of workers chose seldom. In this part indicating that warm or cold weather can't be a factor for using personal protective equipment. So, these factors are not related to use personal protection equipment.

**Table 10**

**Is it cold or warm weather a factor for not using safety equipment?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	4	13.33	3
Almost	11	36.67	2
Seldom	3	10	4
Never	12	40	1
<b>Total (x)</b>	30	100%	

From Table 11, 12 persons or 40% of the workers chose never and 7 persons or 23.33% of the workers chose seldom and 6 persons or 20% of the workers chose almost, whereas 5 persons or 16.67% of the workers choosing always. This table proved that the most workers observance safety programs for passing under the crane, when crane is working. This is an important issue in reducing hazard in construction site.

**Table 11**

**Do you walk over a crane in operation?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	5	16.67	4
Almost	6	20	3
Seldom	7	23.33	2
Never	12	40	1
<b>Total (x)</b>	30	100%	

Table 12 indicated that 22 persons or 73.34% of the workers chose investment, while 8 persons or 26.66% of the workers chose cost. In this part, it can be concluded that safety training is very important factors for reduction hazard in construction site. And also was proven that the most workers understood the safety training is an important factor then when they don't have accident inside the site, they can continue their work without any problem. So, ispending money for safety training is not waste, but indeed is is investment for the company and staffs.

**Table 12**

**Is safety training a cost or an investment?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Cost	8	26.66	2
Investment	22	73.34	1
<b>Total (x)</b>	30	100%	

Table 13 revealed that the 13 persons or 43.34% of workers chose almost, followed by 12 persons or 40% of workers and 3 person or 10% of workers chose always and seldom respectively, while 2 persons or 6.66% of workers selected never. So, it can be interpreted that getting knowledge about reduce hazard before starting the work is very important to work safely.

**Table 13**

**Do you get prior orientation on hazard management before you start work?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	12	40	2
Almost	13	43.34	1
Seldom	3	10	3
Never	2	6.66	4
<b>Total (x)</b>	30	100%	

Table 14 unearthed that the 19 persons or 63.33% of workers chose no. 1, while 7 persons or 23.34% of workers selected no. 3 and lastly 4 persons or 13.33% of workers chose being fast. Thus, it seems that the most workers believed being safe is very important. Because they know that the observance of the safety is effective for their health and reduction hazard.

**Table 14**

**Which one is important to you while working?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Be safe	19	63.33	1
Be funny	0	0	0
Be comfortable	7	23.34	2
Be fast	4	13.33	3
<b>Total (x)</b>	30	100%	

**Problem 3. What are the identify ways to reduce hazards faced by respondents construction workers?**

As can be seen in Table 15, 21 persons or 70% of workers chose no always and 8 persons or 26.67% of workers chose almost, whereas 1 person or 3.33% of workers chose nseldom. Accordingly, using the safety equipment is very important for all workers. Therefore, this is a way for reduction of hazards.

**Table 15**

**Do you use personal safety equipment while working?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	21	70	1
Almost	8	26.67	2
Seldom	1	3.33	3
Never	0	0	—
<b>Total (x)</b>	30	100%	

From Table 16, 12 persons or 40% of workers chose Always, while 8 persons or 26.66% of workers chose Almost. Also, 6 persons or 20% of workers chose Seldom and lastly 4 persons or 13.37% of workers selected Never. Thus, it can be concluded that the most workers read regulations pertaining for safety in construction sites.

**Table 16**  
**Did you read all the regulations pertaining to workplace safety?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	12	40	1
Almost	8	26.66	2
Seldom	6	20	3
Never	4	13.37	4
<b>Total (x)</b>	30	100%	

Table 17 indicated that the 13 persons or 43.33% of workers chose Almost; and likewise 11 persons or 36.67% of workers chose Always. While 5 persons or 16.67% of workers selected Seldom. Also, the only 1 person or 3.33% of workers chose Never. Consequently, it can be explained that the safety signs installed in the workplace can inform people to avoid hazards.

**Table 17**  
**Do you attend to safety signs installed in your workplace when you are working?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	11	36.67	2
Almost	13	43.33	1
Seldom	5	16.67	3
Never	1	3.33	4
<b>Total (x)</b>	30	100%	

As shown in Table 18, 10 persons or 33.33% of worker chose Almost, 9 persons or 30% of workers choosing Seldom and Never respectively. While 2 persons or 6.67% of

workers chose Always. This table has proven that the only few of the workers pick up heavy objects in the workplace alone. Therefore one of ways for reducing hazards, is observance safety issues.

**Table 18**

**Would you pick up heavy objects alone in the workplace?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	2	6.67	3
Almost	10	33.33	1
Seldom	9	30	2
Never	9	30	2
<b>Total (x)</b>	30	100%	

Table 19 reported that the 15 persons or 50% of workers chose Almost, while 7 persons or 23.34% of workers choosing Seldom. Also, 6 persons or 20% of workers selected Always and lastly 2 individuals or 6.66% of workers chose Never. So, it can be concluded that the workers working in the site are assured to be healthy.

**Table 19**

**Do you take medical examination before you got employed in construction site?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	6	20	3
Almost	15	50	1
Seldom	7	23.34	2
Never	2	6.66	4
<b>Total (x)</b>	30	100%	

Table 20 shows that 11 (36.66%) respondents answered always and 11 (36.66%) respondents answered almost, whereas 4 (13.33%) respondents scored seldom and lastly 4 (13.33%) respondents selected never. Therefore, it is proven of Table 20, 75% of the respondents (always and almost) believed human resource department is concerned with safety of the workers before hiring. So, they need to have enough training or knowledge about safety in the workplace before being appointed in the construction projects.

**Table 20**

**Are you required to attend a safety training course certification before you are hired?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	11	36.67	1
Almost	11	36.67	1
Seldom	4	13.33	2
Never	4	13.33	2
<b>Total (x)</b>	30	100%	

As presented in Table 21, 11 (36.66%) respondents answered always and 6 (20%) respondents scored almost, while 8 (26.66%) respondents answered seldom and lastly 5 (16.66%) respondents answered never. Accordingly, it seems that 56.66% of the respondents answered always and almost, which means they have used protection equipment against vapour and toxic that are necessary to use during work for the health of the workers. But 43.33% workers have not usually used protection equipment in danger area that it has a lot of vapour and toxic. It proved that matter approximately 45%

of the workers do not understand about hazard and danger of chemical material and materials in danger areas.

**Table 21**

**Do you use respiratory equipment when you are exposed to dust or toxic gases and vapour?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	11	36.67	1
Almost	6	20	3
Seldom	8	26.66	2
Never	5	16.67	4
<b>Total (x)</b>	30	100%	

In Table 22, 13 (43.33%) respondents answered always, and 11 (36.66%) respondents scored almost. While 6 (20%) respondents answered seldom and there was no any answer for never. Thus, it shows that probably the workers are aware of the danger in the work site so majority of the workers used safety equipments.

**Table 22**

**Do you use safety equipments, when you are working at the ground floor or in the construction site area?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	13	43.33	1
Almost	11	36.67	2
Seldom	6	20	3
Never	0	0	0
<b>Total (x)</b>	30	100%	

As presented in Table 23, 17 (56.66%) respondents selected and 9 (30%) respondents answered always and almost respectively. While the only 3 (10%) respondents answered seldom and also 1 (3.33%) respondent choosing never, which means that 86.6% of the respondents believed that learning regarding safety issues is an important factor in reduction of hazard into construction sites. So, training can give the knowledge to the workers how accomplish their works that result is reduction of hazard.

**Table 23**

**Do you think learning safety issues while working can have an impact on reducing the hazards?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	17	56.67	1
Almost	9	30	2
Seldom	3	10	3
Never	1	3.33	4
<b>Total (x)</b>	30	100%	

Table 24 revealed that 16 (53.33%) respondents answered always and 12 (40%) respondents scored almost, whereas 1(3.33%) respondent selected seldom. Lastly, the only 1 (3.33%) respondent answering never. Thus, it can be concluded that 93.3% respondents believed warning signs in workplace are very essential in reduction of hazard in site and the workers can have a safe place to work.

**Table 24**

**Warning signs have any role in reducing the hazards?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	16	53.34	1
Almost	12	40	2
Seldom	1	3.33	3
Never	1	3.33	3
<b>Total (x)</b>	30	100%	

As can be seen in Table 25, 20 (66.66%) respondents and 10 (33.33%) respondents answered always and almost respectively, while there was no any answer for seldom and never as well. Table 25 also shows that the workers believed there is a need for the safety department to monitor and control the safety in the construction site. Accordingly, 100% of the respondents believed that safety department should monitor and control safety in the work sites, in order to ensure the safety in the work site, thus this will assure the workers, and also management have responsibility to implement safety programs. Therefore, the hazard can be reduced.

**Table 25**

**Does the safety department needs to monitor the working place to prevent hazard?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	20	66.66	1
Almost	10	33.34	2
Seldom	0	0	—
Never	0	0	—
<b>Total (x)</b>	30	100%	

As presented in Table 26, the 18 (60%) respondents and 10 (33.33%) respondents answered always and almost respectively, whereas the only 1 (3.33%) respondent answered seldom and 1 (3.33%) respondent answered never as well. So, it can be seen in Table 26 that 93.33% respondents answered always and almost, which means the most of the workers (respondents) were believed that using belt at high place for welding is very necessary for self protection, so the workers will be out of danger.

**Table 26**

**Do you think using belt for welding in high place is necessary?**

	<b>Frequency (f)</b>	<b>Percentage (%)</b>	<b>Rank (R)</b>
Always	18	60	1
Almost	10	33.34	2
Seldom	1	3.33	3
Never	1	3.33	3
<b>Total (x)</b>	30	100%	

## **5. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Summary**

**Problem 1.** What is the socio-demographic profile of the respondents in terms gender, age, type of work, civil status, education and job type?

- a- In sample, the respondents were only men working in construction sites.
- b- In Iran, the most of the workers working in construction sites had age between 25-29 years old.
- c- We have many construction projects underway, therefore, the most of the workers were full-time.
- d- Most of the respondents were married.
- e- Most of the workers had elementary education.
- f- The concrete workers were the most of the respondents of the study.

**Problem 2.** What are the factors causing hazards faced by respondents?

- a- Most of the respondents use cell phone during work.
- b- Most of workers had awareness a little of the hazard about transfer of places that can be hazardous.
- c- In the projects, the most of the workers did not have enough information about electrical hazard.
- d- While the weather is warm or cold, the most of workers use personal protective equipment.
- e- When crane is working, the most or workers observance safety programs for passing under the crane.
- f- The safety training is very important factors for reduction hazards in construction site because the most of the workers selected section 2 of questions of part two (almost).
- g- The respondents havd good knowledge about reduce hazard before starting the work.
- h- For the most respondents, working under safe consideration is very important.

**Problem 3.** What are the identify ways to reduce hazards faced by respondents construction workers?

- a- Using the safety equipment is very important for the most of workers.
- b- Most of the workers had training concerning the regulation pertaining to safety.
- c- Workers attention to the safety signs installed in the workplace.
- d- A few workers pick up heavy objects do alone in the workplace.
- e- Get medical examination before employment in construction site is very important for workers and owner.
- f- In all projects the owner asked about safety training of workers before hiring.
- g- Most workers use equipment when they were exposure to dust or toxic gases.
- h- Using safety equipment for workers when they worked inside the construction site is important for them.
- i- Safety issues were very important for workers during work.
- j- There were always warning signs at construction sites, which giving an important role in reducing hazards.
- k- The safety department monitored periodically safety issues in all project sites .
- l- Using the safety equipment for welding workers was very important and essential.

## **5.2 Conclusions**

The research work reported on the current state of reduce of hazard on construction sites in shiraz(Iran) reveals a serious lack of structures and procedures at all levels of the construction chain. all workers interviewed in the course of the study are men and most of them are working full time and most of them have experience more than one year too, but approximately half of them don't know good knowledge concern safety and work with safety methods in workplace if we see the tables of part 2 we will understand well about it, because half of respondents have not answered well concern reduce hazard and safety

work and they sometimes do unsafe about their works and if we analysis more then we get it that approximately workers study (education, and train) more before their works, they have better knowledge than another workers now we understood that train before and after employment is so necessary, and the most of workers confirm that train is important in reduce hazard at workplace.

If the company do about safety s train after it can save money, equipment, materials and workers life that is important for workers and society and their family and company because if we cannot reduce hazard and control hazard then we have to accept damage, injure, death about it so management and safety group have to conduct and guide workers towards getting knowledge about hazard and safety program and work with safety. Contractors and consultants of the construction sector in Iran should ensure that every construction contract takes comprehensive account of health and safety requirements for the project, environment and the workers. Workers and civil society should ensure and demand the provision of adequate health and safety policies, procedures and provisions to govern construction work.

It is underlying that there is urgent need for construction stakeholders to educate and create awareness among their workers as well as at management level in education in safety. Top management also needs to enhance their knowledge in particular hazard and safety knowledge through training and courses conducted from time to time. Better understanding of hazard should be taken on priority so that companies have to be emulated to the safety construction program towards global market. It was found that through training and education to the workers at construction is the effective way in nurturing workers. Strategies used in preventing hazard can also be used for any type of project and categories of procurement such as sub contracting. That is mean strategies in all ways could be used as an approach to prevent at construction sites. Strategies on hazard prevention should be made from the onset of construction to ensure hazard and safety awareness at large could be created especially at managerial level of companies and also to the construction workers. The awareness of hazard and safety in construction

were actually could spur economy in construction as well as to make construction to be more productive.

So, according to the results of the study, it can be concluded that two factors in important role reduce hazard were very necessary the first mistake workers and lack knowledge about hazard in work place. The management can corrects it with training for workers and establishing safety and health programs. Second factor was management issues, management should understand (establish and do and monitor and control) well concerning safety and health programs in the workplace, and also should select the appropriate program and performance for reducing hazard by giving enough money and time for this matter.

### **5.3 Recommendation**

The identification of the hazard is very important to prevent accidents at work. Thus, the potential hazard should be identified. The information for hazard identification can be obtained from the equipment and material supplier, site owner and principal contractor. If such information is not available, So a contractor should take actions to identify unknown substances or seek assistance from a specialist if it is necessary. In construction sites, there are three ways for reducing hazard in the workplace, which are namely:

#### *1. Training and education*

OSHA recommends using a formal training program to reduce hazards. Instructors should be well-versed in matters that pertain to safety engineering and materials handling and storing. The content of the training should emphasize those factors that will contribute to reducing workplace hazards including the following:

- Alerting the employee to the dangers of lifting without proper training.
- Showing the employee how to avoid unnecessary physical stress and strain.
- Teaching workers to become aware of what they can comfortably handle without undue strain.

- Instructing workers on the proper use of equipment.
- Teaching workers to recognize potential hazards and how to prevent or correct them.

## *2. Safety and health program management guidelines*

To have an effective materials handling and storing safety and health program, managers must take an active role in its development. First, line supervisors should be convinced of the importance of controlling hazards associated with materials handling and storing and must be held accountable for employee training. An ongoing safety and health program should be used to motivate employees to continue to use necessary protective gear and to observe proper job procedures. OSHA's recommended "Safety and Health Program Management Guidelines" issued in 1989 can provide a blueprint for employers who are seeking guidance on how to effectively manage and protect worker safety and health. The four main elements of an effective occupational safety and health program are (a) management commitment and employee involvement, (b) worksite analysis, (c) hazard prevention and control, and (d) safety and health training. These elements encompass principles such as establishing and communicating clear goals of a safety and health management program; conducting worksite examinations to identify existing hazards and the conditions under which changes might occur; effectively designing the job site or job to prevent hazards; and providing essential training to address the safety and health responsibilities of both management and employees.

## *3. Ergonomic safety and health principles*

Ergonomics is necessary in reduce hazard because if the work is not fit worker so worker wont comfort with his/her job then worker doesn't have good feel about his/her work and to get stress in workplace , we know well stress is one of causes of hazard generation , and management group and human resource management have important role in put workers in good and according placement, ergonomics is defined as the study of work and is based on the principle that the job should be adapted to fit the person, rather than forcing the person to fit the job. Ergonomics focuses on the work environment and items such as design and function of workstations, controls, displays, safety devices,

tools, and lighting to fit the employees' physical requirements and to ensure their health and well being.

Ergonomics includes restructuring or changing workplace conditions to make the job easier and reducing/stressors that cause hazard in workplace. In the area of materials handling and storing, ergonomic principles may require controls such as reducing the size or weight of the objects lifted, installing a mechanical lifting aid, or changing the height of a pallet or shelf. Management in construction site in Shiraz can use these ways for reduce hazard and prevent injury and death in workplace and it can productive for improvement work and save money and lives.

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## Appendix

### A. Questionnaire

NAME: نام خانوادگی:

#### Part one: قسمت اول

اطلاعات جمعیتی پرسشنامه Demographics Survey Questionnaire

لطفا در کادر مناسب پر کنید: Please fill the appropriate box:

a. WHAT IS YOUR GENDER الف) جنسیت شما چیست

Male مرد

Female زن

B. WHAT IS YOUR AGE? ب) چند سال دارید ؟

Under 20 زیر 20 سال

20 – 24 20 تا 24

25 – 29 25 تا 29

30 – 39 30 تا 39

40 – 49 40 تا 49

50 or above 50 یا بالاتر

c. WHAT TYPE OF WORKER ARE YOU? د) چه نوع کارگری هستید؟

تمام وقت

کارگر Regular Full-Time Employee

کارگر نیمه وقت Regular Part-Time Employee

d. HOW LONG DID YOU WORK AT THIS PROJECT? (ح) چه مدتی در این پروژه کار میکنید؟

کمتر از یک سال Less than a year

یک تا سه سال 1 year but less than 3 years

سه تا پنج سال 3 years but less than 5 years

پنج تا هشت سال 5 years but less than 8 years

e. WHAT IS YOUR CIVIL STATUS? (خ) وضعیت خانوادگی شما چیست؟

مجرد Single

متاهل Married

f. WHAT IS YOUR EDUCATION? (ع) وضعیت تحصیلی شما چیست؟

ابتدایی Elementary

دبیرستان High school

فنی و حرفه ای Vocational

h. WHAT IS YOUR JOB TYPE? (ف) نوع شغل شما چیست؟

جوشکاری Welding

بتنی Concrete

سازه ای Structural

قاب کار Frame work

نقاش Painting

دیگر Others

## قسمت دوم: Part 2

Direction: please choose the best answer set. لطفا جواب درست را با تیک مشخص کنید.

1- Do you use cell phone while you are working at the site?

ایا در هنگام کار در نقاط حساس از تلفن همراه استفاده می کنید؟

Always

Almost

Seldom

Never

2- Do you walk through dangerous and unfinished sites?

ایا شما در کارگاه از محل های خطرناک رفت و آمد می کنید؟

Always Almost Seldom Never

3- Do you troubleshoot an electrical hazard?

ایا در صورت مشاهده خطر الکتریکی خودتان جهت رفع اشکال اقدام می نمائید؟

Always Almost Seldom Never

4- Do you use personal safety equipment when the weather is cold or warm?

ایا سردی و گرمی هوا باعث می شود که شما از وسائل حفاظت شخصی استفاده نکنید؟

Always Almost Seldom Never

5- Do you walk over a crane in operation?

ایا در هنگام حمل بار توسط جرثقیل در محل کارگاه مسیر عبور خود را از زیر جرثقیل انتخاب می نمائید؟

Always Almost Seldom Never

6- Is safety training a cost or an investment?

ایا شما فکر می کنید آموزش ایمنی هزینه است یا سرمایه گذاری؟

a) Is a cost (الف) هزینه است

b) Is investment (ب) سرمایه گذاری است

7- Do you get prior orientation on hazard management before you start work?

ایا شما اطلاعاتی درباره کاهش خطرات کارگرفته اید قبل از انجام دادن کار؟

Always Almost Seldom Never

8- Which one is important to you while working?

کدامیک مهمتر است که شما در محل کارتان انجام بدهید؟

Be safety Be funny Be comfortable Be speed

### Part 3: قسمت سوم

1- Do you use personal safety equipment while working?

ایا شما در هنگام کار از لوازم و تجهیزات ایمنی و حفاظت شخصی استفاده می کنید ؟

Always              Almost              Seldom              Never

- 2- Do you study all the regulations pertaining to workplace safety?

ایا شما تمامی ائین نامه های مربوط به ایمنی کارگاه را مطالعه کرده اید؟

Always              Almost              Seldom              Never

- 3- Do you attend to safety signs installed in your workplace when you are working?

ایا در هنگام کار کردن توجهی به علائم هشدار دهنده ایمنی نصب شده در محل کار دارید ؟

Always              Almost              Seldom              Never

- 4- Would you pick up heavy objects alone in the workplace?

ایا شما جهت برداشتن اجسام سنگین در کارگاه به تنهایی اقدام می کنید؟

Always              Almost              Seldom              Never

- 5- Did you take medical examination before you got employed in construction site?

ایا قبل از استخدام شما در کارگاههای ساختمانی مورد معاینه پزشکی قرار می گیرید؟

Always              Almost              Seldom              Never

- 6- Are you required to ask a safety training course certification before you are hired?

ایا قبل از شروع به کارکردن در سایت های ساخت و ساز در مورد گذراندن دوره های آموزش ایمنی از شما سوال

می کنند؟ \_\_\_\_\_

Always              Almost              Seldom              Never

- 7- Do you use respiratory equipment when you are exposed to dust or toxic gases and vapor?

ایا در هنگام قرار گرفتن در معرض گرد و غبار یا گاز های سمی و بخار از تجهیزات حفاظت تنفسی استفاده می

نمائد؟ \_\_\_\_\_

Always              Almost              Seldom              Never

- 8- Do you use safety equipment, when you are working at the ground floor or in the construction site area?

ایا هنگامیکه شما در طبقات همکف یا محوطه سایت ساخت و ساز مشغول بکار هستید از تجهیزات حفاظتی و ایمنی استفاده می نمایید؟

Always                      Almost                      Seldom                      Never

9- Do you think learning safety issues while working can have an impact on reducing the hazards?

به نظر شما آموزش مسائل ایمنی در حین کار می تواند تاثیری بر روی کاهش خطرات داشته باشد؟

Always                      Almost                      Seldom                      Never

10- Do installing Signs and warning signs, in construction site have effects in reducing hazards?

ایا وجود علائم و تابلوهای خطر نقشی در کاهش خطرات دارند؟

Always                      Almost                      Seldom                      Never

11- Dose the safety department monitor the working place to prevent hazard?

ایا شما فکر می کنید که بخش ایمنی برای نظارت بر کار برای جلوگیری از خطر است؟

Always                      Almost                      Seldom                      Never

12- Do you use belt for welding in high place?

ایا استفاده از کمربند برای جوشکاری در نقاط بلند لازم است؟

Always                      Almost                      Seldom                      Never

Thank you for your valuable assistance with this important research

با تشکر از شما به خاطر کمک مهم شما به این تحقیق

***B. Summary of the Results (Part two and three)***

Summary of part 2

Question	Always	Almost	Seldom	Never
1- Do you use cell phone while you are working at the site?	8	7	6	9
2- Do you walk through dangerous and unfinished sites?	8	8	7	7
3- Do you troubleshoot an electrical hazard?	2	13	7	8
4- Do you use personal protective equipment when the weather is cold or warm?	4	11	3	12
5- Do you walk over a crane in operation?	5	6	7	12
6- Is safety training a cost or an investment?	8	22	0	0
7- Do you get prior orientation on hazard management before you start work?	12	13	3	2
8- Which one is important to you while working?	19	0	7	4

Summary of part 3

Question	Always	Almost	Seldom	Never
1- Do you use personal safety equipment while working?	21	8	1	0
2- Do you study all the regulations pertaining to workplace safety?	12	8	6	4
3- Do you attend to safety signs installed in your workplace when you are working?	11	13	5	1
4- Would you pick up heavy objects alone in the workplace?	2	10	9	9
5- Did you take medical examination before you got	6	15	7	2

employed in construction site?				
6- Are you required to attend a safety training course certification before you are hired?	<b>11</b>	<b>11</b>	<b>4</b>	<b>4</b>
7- Do you use respiratory equipment when you are exposed to dust or toxic gases and vapour?	<b>11</b>	<b>6</b>	<b>8</b>	<b>5</b>
8- Do you use safety equipment, when you are working at the ground floor or in the construction site area?	<b>13</b>	<b>11</b>	<b>6</b>	<b>0</b>
9- Do you think learning safety issues while working can have an impact on reducing the hazards?	<b>17</b>	<b>9</b>	<b>3</b>	<b>1</b>
10- Do installing signs and warning signs in construction site have effects in reducing hazards?	<b>16</b>	<b>12</b>	<b>1</b>	<b>1</b>
11-Does the safety department monitor the working place to prevent hazard?	<b>20</b>	<b>10</b>	<b>0</b>	<b>0</b>
12- Do you use belt for welding in high place?	<b>18</b>	<b>10</b>	<b>1</b>	<b>1</b>