

Identify and Analyze the Most Important Factors Affecting the Safety of Employees in Construction Sites in Iraq

Yasser Sahib Nassar

*College of physical Planning, University
of Kufa*

Dr.nassar12@yahoo.com

Ahmed Mustafa Hussein

*Ministry of Construction and Housing &
Municipalities & Public Works / National
Center for Engineering Consultancy*

ahmed_mustafa1993@yahoo.com

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Abstract:

Construction sites are among the most dangerous construction industries in terms of exposing the safety and health of workers to various dangerous accidents during the construction process. Where the statistics of the International Labor Organization show that there is one death every three minutes as a result of a work injury and that there are four different injuries occurring in the world every second. The construction industry has been identified as one of the most dangerous industries, due to the nature of the work resulting from the integration of materials, tools, the environment and various human factors. A message of worker safety consideration during design sites. It is necessary to give the highest importance to the occupational and health safety of workers in construction projects sites in order to reduce risks and losses. Among worker. Iraq suffers from a lack of attention to safety and health of employment. Despite the importance of safety and health for workers, we note that research that deals with on the issue of safety in construction projects is still very little. Empirical studies on the effect of national culture on safety attitudes, behavior, and performance appear to be few. It does not seem unreasonable to expect people's attitudes toward risk to differ according to the deep values, beliefs and assumptions that local culture influences safety in projects. Therefore, the focus was on the most important factors affecting the safety and health of workers in construction sites and making suggestions about who bears these injuries to the employer or contractor and all safety measures are mentioned while writing the contract and placing them as basic conditions in the project.

Key Word : Construction projects, Worker safety and health, Worker injuries

Aims of study:

- 1.To determine the main factors that affect the safety and health of workers in construction sites in Iraq.
- 2.Analyzing and arranging the most important factors affecting labor productivity through the relative importance index in Iraqi construction projects.

Problem of study:

Insufficient knowledge of the risks involved in the construction industry and the quality of the risks surrounding it led to unpredictability and hedging of the expected risks with clear reports on the accidents that occur and the extent of the injury.

Hypothesis of study:

There is a statistically significant correlation between the effectiveness of occupational safety and health procedures and rules used in construction sites and the level of qualification at The level of regulatory institutions

Introduction

Construction sites are among the most dangerous construction industries in terms of exposing the safety and health of workers to various dangerous accidents during the construction process. Where the statistics of the International Labor Organization show that there is one death every three minutes as a result of a work injury and that there are four different injuries occurring in the world every second. The construction industry has been identified as one of the most dangerous industries.

1.Safety

What is meant by public safety is to avoid accidents that a person or property may be exposed to, reduce them or prevent their dangers by providing preventive and backup services to protect the three elements of production (humans, machinery and materials) [1]. Occupational Safety and Health is defined as the administrative activities and procedures for protecting workers from the risks arising from the work they perform and from workplaces that may lead to their illness and accidents. [2] Safety definitions have varied and diversified with the diversity of sources of risks resulting from contemporary civilized life. Safety is defined as "all the procedures and efforts made to prevent the occurrence of risks in industrial establishments by using technical means that prevent the risk or reduce its harmful effects in order to preserve the health and safety of workers and to preserve economic gains. This study [3] describes it as every action taken by the stakeholders involved in the implementation of a specific project, large or small, to reduce or reduce work accidents and occupational diseases[4], or provide means of protection for employment during the implementation of the work.

2.Factors Affecting Labor Safety and Classification

Factors affecting worker safety have been investigated by many researchers. The importance of these factors varies from country to country and from project to project[5]. Table 1 shows the most important results of some researchers conducted in some countries. As many researchers in engineering project management in most developed countries attempt to classify the factors that affect the safety of workers in group building projects. By adopting many techniques and methods to classify the influencing factors[5], the researcher noted that there is no convergence of opinions and classifications in different research, as shown in

Table (1) Summary of Researches to Identifying the Factors that Affect Safety Performance and Classifications

S/N	Groups	Factors Affecting
1.	Project Nature	1. Volume of the project
		2. Cost of the project
		3. Arrangement and organization the site (Tide site)
		4. Planning and scheduling of the project
		5. Application of new technology in construction projects
		6. Type of the owner (Owner identify)
		7. Clear and easy of project's design
		8. Lighting the site during night working hour
2	Historic, Human & Psychological Climate	1. Worker age
		2. Worker experience
		3. Worker education
		4. Worker culture background
		5. Worker marital status
		6. Worker safety training received
		7. Worker safety awareness, knowledge & involvement
		8. Worker accident's experience
		8. A Worker's ability to communicate with others
		10. Relation between the management and workers on the site

		11. Relation between the supervisor and workers on the site
		12. Interrelation between the workers on the site
		13. Decrease work pressure on workers
		14. Non-excessive overtime work for workers
3	Safety Educating, Training and Emergency/ /Disaster Planning and Preparations	Guidance and training of workers to safety
		Brochures and publications on safety
		Safety seminars held by the management of the project
		Safety poster
		Training of first aid for all workers
		Develop a plan to respond to emergencies
		Training workers to respond to emergencies through the exercises
4.	Signs and warning Signals	The use of danger signs
		he use of caution signs
		The use of instruction signs
		The use of traffic signs
		The use of barricades to close the site
5.	Management Commitment and Safety Meetings	Safety awareness of company's top management
		Safety awareness of project managers
		Availability a clear company's safety policy
		Issuing & implementation of in-house safety rules, safety program or manuals
		Conduction of safety policy review
		Safety inspection by the top management
		Management's attitude towards worker's welfare
		Conducting safety meeting in the site by the site engineer
		Conducting safety meeting before each activity begins
		Attendance of Safety meetings by top management
6.	Role of Government & Safety inspection	Issuing laws, standards, regulations & legislations of safety
		Strict implementation of safety instructions
		The punishment in case of violation of laws, standards regulations & legislations of safety
		Safety inspection by government (ministry of workers and municipalities)
7.	Personal Protective Equipment	The use of protective head
		The use of protective foot
		The use of gloves and protective face
8.	Medical Facilities	Permanent presence of a medical specialist at the site
		Availability of medical apparatus in the site
		Periodical medical examination of workers
9.	Fire Prevention	Availability of Adequate fire extinguishers in the site
		Good storage of flammable liquids and combustible materials
		Periodical maintenance of fire extinguishers which located in the site
10	Scaffolds and Crane, Lifting Equipment	"Design scaffolds as international Specifications (OSHA for example)"
		The type of material which manufactured the scaffolds
		Selection of licensed operator who having skill and efficiency
		Enforce limited amount weights to be lifted by crane with clear stickers shows the limits
11	Welfare Facilities	Provision of adequate facilities for first aid treatment
		Provision of food and drinking water
		Provision of an ambulance in the site
		Provision of special places for smoking
		Provision of adequate toilets

3. Construction projects :

The project is defined as a specific activity with (time, cost and quality) to achieve a set of specific accomplishments that reach the quality standards and requirements[6], as it is done in order to provide a product or service to achieve a intended change and it is a work that the individual undertakes to implement a specific idea, whether it is a product Or a service[7], the project uses some of the main resources (such as financial, knowledge, and cadres) to implement this idea. The project also provides a service, that is, it solves a societal problem, and this is in exchange for something material. There are many [8] of ideas and projects that benefit the individual and the community, whether it is its value and its service need, or if it is of economic benefit to the individual and society[9]. There are other concepts that are called to the project, including: [10] The project is an activity in which specific resources are used, and money is spent in order to obtain benefits during an agreed period. , Which is the tax card, and has a commercial record and license[11]. The project is an automatic activity for achieving a purpose, and it takes place in a normal social environment

4.Field of study :

Based on a site survey aimed at collecting all necessary information in an effective manner, the survey offers (70) influential factors in Sefety, which have been collected from previous relevant research, review and revision by the participants in the initial pilot questionnaire. These factors were classified into 70 factors surveyed in 11 main groups, namely : (1. Project Nature group, 2. Historic, Human & Psychological Climate group, 3. Management Commitment and Safety Meetings group, 4. Signs and warning Signals group, 5. Management Commitment and Safety Meetings group, 6. Role of Government & Safety inspection group, 7. Personal Protective Equipment group, 8. Medical Facilities group, 9. Fire Prevention group, 10. Scaffolds and Crane, Lifting Equipment group, 11. Welfare Facilities group) as shown table 2.

Table (2) Factors affecting for labor safety

Factors affecting for labor safety	Arrange for group	Arrange for overall
Project Nature		
Volume of the project	3	21
Cost of the project	5	34
Arrangement and organization the site (Tide site)	2	19
Planning and scheduling of the project	7	38
Application of new technology in construction projects	6	34
Type of the owner (Owner identify)	4	28
Clear and easy of project's design	8	40
Lighting the site during night working hour	1	9
Emergency/ /Disaster Planning and Preparations		
Develop a plan to respond to emergencies	1	18
Training workers to respond to emergencies through the exercises	2	38
Signs, Signals and Barricades		
The use of danger signs	1	8
he use of caution signs	2	10
The use of instruction signs	3	11
The use of traffic signs	5	19
Historic, Human & Psychological Climate		

Worker age	6	21
Worker experience	2	5
Worker education	8	26
Worker culture background	10	32
Worker marital status	14	42
Worker safety training received	7	23
Worker safety awareness, knowledge & involvement	4	15
Worker accident's experience	5	17
A Worker's ability to communicate with others	12	35
Relation between the management and workers on the site	13	36
Relation between the supervisor and workers on the site	9	26
Interrelation between the workers on the site	10	32
Decrease work pressure on workers	3	7
Non-excessive overtime work for workers	1	4
Welfare Facilities		
Provision of adequate facilities for first aid treatment	1	13
Provision of food and drinking water	2	29
Provision of an ambulance in the site	4	44
Provision of adequate toilets	3	42
Provision of special places for smoking	5	46
Administrative and Management Commitment		
Safety awareness of company's top management	2	11
Safety awareness of project managers	1	6
Availability a clear company's safety policy	4	23
Issuing & implementation of in-house safety rules, safety program or manuals	5	23
Conduction of safety policy review	6	30
Management's attitude towards worker's welfare	3	22
Safety Inspections		
Safety inspection by government (ministry of workers and municipalities)	2	15
Safety inspection by the top management	1	11
Safety inspection by insurance companies	3	20
Safety Meetings		
Conducting safety meeting in the site by the site engineer	1	6
Conducting safety meeting before each activity begins	2	32
Attendance of Safety meetings by top management	3	33
Role of Government & Engineering Societies		
Issuing laws, standards, regulations & legislations of safety	3	17
Strict implementation of safety instructions	1	12
The punishment in case of violation of laws, standards regulations & legislations of safety	2	13
Crane and Lifting Equipment		
Selection of licensed operator who having skill and efficiency	1	12
Enforce limited amount weights to be lifted by crane with clear stickers shows the limits	2	15
Safety Educating & Training		
Guidance and training of workers to safety	1	15
Brochures and publications on safety	4	39
Safety seminars held by the management of the project	5	39

Safety poster	2	23
Training of first aid for all workers	3	24
Disposal of Hazardous Materials and Waste		
Develop a risk management plan	1	20
Develop a waste management plan	3	37
Quick transfer of construction waste out the site	2	22
Personal Protective Equipment		
The use of protective head	2	2
The use of protective foot	3	3
The use of gloves and protective face	1	1
Excavation, Trenching, Shorting		
The use of barricades to prevent collapse of Soil during work	1	1
Soil type in terms of coherence	2	10
Low level of groundwater below the excavation work	3	32
Scaffolds		
Design scaffolds as international specifications (OSHA for example)	1	7
The type of material which manufactured the scaffolds	2	7
Correct using of scaffolds	3	25
Fire Prevention		
A vailability of Adequate fire extinguishers in the site	1	14
Good storage of flammable liquids and combustible materials	2	19
Periodical maintenance of fire extinguishers which located in the site	3	25
Transportation		
Vehicle condition /regular maintenances	2	16
Wear seat belts while riding cars and trucks and mechanisms	5	22
Driver training	3	24
Economic Investment		
Allocating specific budget for safety requirements	3	31
Financial motivation to application of safety	2	25
Agreement with insurance companies	1	19
Medical Facilities		
Permanent presence of a medical specialist at the site	3	45
Availability of medical apparatus in the site	1	27
Periodical medical examination of workers	2	43

5. Test of factors:

The results that we obtained on the level of factors affecting safety and their applicability according to the relative importance on the general, construction projects, the researcher used ready-made applied programs for this process, especially the statistical (SPSS.V22) program for comparison, whether there are fundamental differences between the factors affecting or not.

R²: Regression between factors

B : Variables

T : Significant

Table (3) Statistical Analysis And The Regression

Groups	R ²	B	T	Mean	Ranking
Project nature	0.91	6.229 (CONSTANT) 2.457X1	6.235	26.2	4
Historic, Human & Psychological Climate		4.258X2	3.09	25.1	11
Safety Educating, Training and Emergency/ /Disaster Planning and Preparations		4.407X3	12.123	24.6	2
Signs and warning Signals		4.954X4	12.239	24.3	1
Signs and warning Signals		2.469X5	6.896	23.2	3
Management Commitment and Safety Meetings		1.657X6	4.632	23.2	6
Role of Government & Safety inspection		1.666X7	4.869	22.1	5
Personal Protective Equipment		1.369X8	3.932	22.1	8
Medical Facilities		1.258X9	3.75	21.8	9
Fire Prevention		1.698X10	4.23	21.5	7
Scaffolds and Crane, Lifting Equipment		1.023X11	3.12	21.5	10

So The Linear Regression through the Origin :

$$\hat{Y} = (6.229 + 2.457X1 + 4.258X2 + 4.407X3 + 4.954X4 + 2.469X5 + 1.657X6 + 1.666X7 + 1.369X8 + 1.258X9 + 1.698X10 + 1.023X11)$$

6. Conclusion

From table-3 of statistical analysis and the regression equation it is found that :

- The value of the determination coefficient ($R^2 = 0.91$) appeared, and this means that the explanatory variables explain the proportion (91%) of the variance, and that the independent variables are explained by the estimated model.
- The greatest effect was signs and warning Signals (4.954X4) since increasing one unit of it affected while it was Scaffolds and Crane, Lifting Equipment the least effect by (1.023X11)
- The most reliable variables is signs and warning Signals that (t) was 12.239 while the variable Historic, Human & Psychological Climate the least, was (3.09).

Conflicts of Interest

The author declares that they have no conflicts of interest.

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تحديد وتحليل اهم العوامل المؤثرة على سلامة العمال في المشاريع الانشائية في العراق

احمد مصطفى حسين

وزارة الاعمار والاسكان والبلديات والاشغال
العامة / المركز الوطني للاستشارات الهندسية

ahmed_mustafa1993@yahoo.com

ياسر صاحب نصار

كلية التخطيط العمراني، جامعه الكوفة

Dr.nassar12@yahoo.com

الخلاصة

تعد المشاريع الانشائية من أخطر الصناعات الانشائية من حيث تعرض سلامة وصحة العمال للحوادث المتنوعة والخطرة اثناء عملية البناء. إذ تبين احصائيات منظمة العمل الدولية وجود حادثة وفاة كل ثلاثة دقائق نتيجة إصابات العمال وان هنالك اربع إصابات مختلفة تحدث في العالم كل ثانية. وقد تم تحديد صناعة البناء باعتبارها واحدة من الصناعات الأكثر خطورة، وذلك بسبب طبيعة العمل الناتج عن تكامل المواد والأدوات والبيئة والعوامل البشرية المختلفة حيث من الضروري إعطاء أهمية قصوى للسلامة المهنية وال صحية للعمالة في مواقع المشاريع الانشائية وذلك لتقليل المخاطر والخسائر بين العمالة. حيث يعاني العراق من عدم الاهتمام بسلامة وصحة العمالة. ورغم أهمية السلامة والصحة للعاملين نلاحظ ان الأبحاث التي تطرقت لموضوع السلامة في المشاريع الانشائية تظل قليلة. يبدو أن الدراسات التجريبية حول تأثير الثقافة الوطنية على مواقف وسلوك وأداء السلامة قليلة. لا يبدو من غير المعقول أن نتوقع أن تختلف مواقف الناس تجاه المخاطر وفقاً للقيم والمعتقدات والافتراضات العميقة. لذا تم التركيز في هذا على اهم العوامل المؤثرة على سلامة وصحة العاملين في المواقع الانشائية وعمل اقتراحات حول من يتحمل هذه الإصابات صاحب العمل او المقاول ويتم ذكر كافة إجراءات السلامة اثناء كتابة عقد المقاولة ووضعها من الشروط الأساسية في المشروع.

الكلمات الدالة: المشاريع الانشائية، السلامة والصحة للعمال، إصابات العمال.