# Evaluating the Effectiveness of Occupational Health and Safety Management System of Construction Companies in Iraq (AI-Rasheed State Contracting Construction Company as a case study)

Asst. Lecturer Awss Hatim Mahmoud M.Sc. Construction Projects Management Civil Engineering Baghdad University

## Abstract

In most countries, construction work is considered to be one of the most hazardous industrial activities. It can easily be seen that there is a consistently higher rate of fatal injury for the construction sector when compared with the country's average fatal injury rate, the occupational health and safety management system (OHSMS) can contribute to improvements in the industry's performance. When accidents happen, the costs are high in people, profits and productivity. One of the best ways to avoid injuries and minimize costs is through good planning and coordination both before and on the job.

The objective of this research is to review the concept, definition, and benefits of safety management system with evaluating the effectiveness of occupational health and safety management system for construction companies in Iraq through field survey and developing checklist to investigate, record, and analyze the facts of the existing safety management system of Al-Rasheed state contracting construction company. The research conclusions show that Al-Rasheed state contracting construction company isn't aware of safety importance, top management considers safety as luxury, has no interest of safety activities, doesn't consider safety as an aspect for pre-qualification of contractors, lack of legislation that obliged companies to follow safety system, and practicing poor safety actions. Several proper solutions were recommended to improve the existing safety management system such as developing safety policy, the role of leadership and commitment to safety, documentation of safety program, and proper legislation to activate the role of National Center of Health and Occupational Safety (NCHOS).

**KEYWORDS:** Occupational health and safety management system, construction safety, safety practices, safety performance.

#### الخلاصية

تعتبر الصناعة الإنشائية في معظم دول العالم من اخطر الصناعات. يمكن بسهولة ملاحظة ارتفاع نسبة الحوادث والحوادث المميتة تحديدا في قطاع التشييد إذا ما قورن بباقي القطاعات لنفس البلد، نظام إدارة الصحة والسلامة والإنتاجية. إحدى الطرق المثلى لتجنب الحوادث وتقليل الكلف التخطيط والتنسيق قبل وأثناء تنفيذ العمل. هدف البحث عرض مفهوم وتعريف وفوائد نظام إدارة السلامة مع تقيم فاعلية نظام إدارة الصحة والسلامة المهنية للشركات الإنشائية العراق المثلى لتجنب الحوادث وتقليل الكلف التخطيط والتنسيق قبل وأثناء تنفيذ العمل. المتعلقة بنظام إدارة المثلى لتجنب الحوادث وتقليل الكلف التخطيط والتنسيق قبل وأثناء تنفيذ العمل. المتركات الإنشائية العراقية من خلال المسح الميداني و تطوير استمارة فحص لتحري وتسجيل ومن ثم تحليل الحقائق المتركات الإنشائية العراقية من خلال المسح الميداني و تطوير استمارة فحص لتحري وتسجيل ومن ثم تحليل الحقائق الرشيد للمقاولات الإنشائية أهمية السلامة المهنية لشركة اللرشيد للمقاولات الإنشائية. بينت نتائج البحث عدم إدراك شركة الرشيد للمقاولات الإنشائية أهمية السلامة المهنية الركان الإدارة العليا تعتبر السلامة رفاهية وعدم اعتبار ها جزء الرشيد للمقاولات الإنشائية أهمية السلامة المهنية لشركة الوسيد للمقاولات الإنشائية. بينت نتائج البحث عدم إدراك شركة الرشيد للمقاولات الإنشائية أهمية السلامة ومعالياتها كون الإدارة العليا تعتبر السلامة رفاهية وعدم اعتبارها جزء من تقيم الرشيد للمقاولات الإنشائية ألمية المالمة ومعالياتها كون الإدارة العليا تعتبر السلامة والمية وعدم اعتبارها جزء من تقيم المقاولين مع غياب التشريعات التي تلزم الشركات الإنشائية بإتباع نظام السلامة وماهية وعدم اعتبارها جزء من تقيم المقاولين مع غياب التشريعات التي تلزم الشركات الإنشائية بالمودة والتزام ودعم القيادة للسلامة وتوثيق برنامج المنامية المرامة الحالي من خلال وضع سياسة للجودة والمالمة.

### **1. INTRODUCTION**

Hazard identification is fundamental to construction safety from statistical, legislative and risk management perspectives. However, from a practical standpoint, all site-based activities are made up of a series of tasks executed by construction operatives. Association of hazards with tasks becomes important to both managing construction safety and communicating safety and hazard awareness down to the people who are actually exposed to the hazards. In practice, projects are always faced with time, cost and manpower constraints so tasks also need to be prioritized in terms of risk so that limited site resources can be focused upon the tasks that expose operatives to the greatest danger.

Achieving a safe workplace on a building site is a critical measure of the success of any construction project whether of a civil, commercial, retail or residential nature. Occupational health and safety management system need to be continually monitored and reviewed throughout in order to be effective in the reduction, and ultimately, elimination of accidents or health and safety incidents. One might expect injury rates to decrease industry-wide as a result of increased safety efforts.

#### 2. RESEARCH JUSTIFICATION

The reasons behind carrying out this research work are:

- a. Top-managements of construction companies in Iraq aren't aware of the significance of safety toward providing better value to their projects and businesses.
- b. The majority of the companies depend on intuition, judgment, and experience to manage risks in construction.
- c. Construction industry has had a poor safety record in comparison with other industries.

## 3. RESEARCH OBJECTIVE

The objective of the research is to evaluate the effectiveness of occupational health and safety management system of construction companies in Iraq.

## 4. SAFETY MANAGEMENT CONCEPT

Safety management and project management are very similar <sup>[1]</sup>. Goals are established, costs managed, plans developed, performance measured and outcomes are evaluated. Not only are safety management techniques the same as those used for project management but safety management will enhance project management efforts by improving communication and contractor relationships and by minimizing problems, delays and unnecessary costs. By implementing an effective safety management system, the entire project team of contractors, managers, designers and employees will be empowered to meet their responsibilities, helping to achieve project goals.

As regards the current state of adopting safety as a culture in the construction industry, recent improvements in safety management have taken place as a combination of efforts of owners, contractors, subcontractors, and designers. The owner's involvement has shown to favorably influence project safety performance by setting safety objectives, selecting safe contractors, and participating in safety management during construction <sup>[2]</sup>.

# 5. CONSTRUCTION OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM DEFINITION

Construction occupational health and safety management system constitute a set of measures concerning health and safety management that are implemented and operated continually and holistically, conducted in conjunction with other management systems, such as construction management system. The system comprises the following <sup>[3]</sup>:

- a. Declarations of policies related to health and safety.
- b. Investigation of risks and/or hazards and determination of countermeasures to be taken based on the result of the investigation.
- c. Adoption of goals for health and safety.
- d. Formulation, implementation, evaluation and improvement of system for health and safety.

## 6. SAFETY MANAGEMENT SYSTEM AND COST

From a financial standpoint, safety, and the effects of its absence (accidents) is a key cost driver for construction companies. Well run and profitable construction companies typically also support effective safety management system, regardless of the direction of the insurance market <sup>[4]</sup>.

Thus the most important step in controlling costs is to run safe construction projects, which require continuous and effective implementation of a well documented and periodically updated safety management system constituting safety policies, safety roles and responsibilities, safety training, orientation and implementation procedures as well as safety work rules.

## 7. REASONS OF ACCIDENTS IN CONSTRUCTION SITES

The nature of construction work and its organization means that many hazards are unique to the industry, and are difficult to identify and control because of <sup>[5]</sup>:

### 7-1 Nature of Work

Construction work involves the use of heavy equipment, hand and power tools and materials such as wood, concrete, paint and fiberglass. Many of these materials, such as solvents, adhesives and explosives, are hazardous to health. Work is conducted from precarious surfaces such as ladders and scaffolds, often many meters above ground level.

#### 7-2 Nature of Sites

Construction sites are, by their very nature, temporary and change constantly as work progresses and new occupations arrive on site. Preventive strategies are especially difficult to implement in such a changing environment. A site that is safe one day may not necessarily be safe the next, so attention must be maintained at all times.

## 7-3 Organization of Work

Different occupations are present at different stages of work on site, and several occupations may share the same work area. When a hazard is created by the work performed by a particular occupation, other occupations in the same area can also be exposed to unexpected hazards.

While <sup>[6]</sup> shows that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor safety management, which result in unsafe work methods, equipment and procedures.

# 8. BENEFITS OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM

The occupational health and safety management system is aimed at improving the overall management and co-ordination of health, safety and welfare throughout construction projects to reduce the large numbers of serious and fatal accidents and cases of ill health which occur every year in the construction industry<sup>[7]</sup>.

While <sup>[8]</sup> said that (OHSMS) are reduce or eliminate injuries and the benefits this can provide for the project and key stakeholders, both in terms of cost savings and intangibles such as improved company reputation, motivated workforce and staff retention.

## 9. RESEARCH METHODOLOGY

The research work, undertaken to achieve the research objective, has adopted the following methodology:

- a. Literature survey includes reviewing of pertinent literature, covering; scientific references including textbooks, conferences, journals, and magazines that outlined and discussed the health and safety management subject.
- b. Field survey includes developing checklist to investigate and record the facts of the existing safety management system of Al-Rasheed state contracting construction company (Appendix-A).
- c. Analyzing the collected data to study and evaluate the existing system and to indicate the major weakness, lacks and deficiencies.
- d. Introducing the required recommendations to apply and adopt them.

## 10. FIELD SURVEY OF THE EXISTING SYSTEM

Visits to the national center of health and occupational safety and to Al-Rasheed state contracting construction company where made, data were obtained and checklist based on the collected data was developed as shown by table (1) and appendix-A:

#### 10-1 NATIONAL CENTER OF HEALTH AND OCCUPATIONAL SAFETY (NCHOS) / IRAQ

National center of health and occupational safety / the ministry of work and social affairs is one of the authorities that participate in developing legislation and regulations relevant to construction safety. (NCHOS) distributes accident forms of occupational accidents to all Iraqi ministries to report accident occurred to the center in order to up date the information of the accidents data base, this is the only major activity of the (NCHOS) at the existing time due to the limited resources, and lack of the required organizing regulation to control its work, table (1) describe the details number and percentage of accidents for construction sites.

## 10-2 ENVIRONMENT AND SAFETY SECTION / AL-RASHEED STATE CONTRACTING CONSTRUCTION COMPANY

Environment and safety Section is linked organizationally to the general director, it has authorities and responsibilities to monitor all activities, identify hazards and take suitable actions to protect employees and equipment, follow up deficiencies, and prevent accidents occurrence in the future. Environment and safety Section staff are civil and mechanical, engineers, physicist, chemist, and administrator, this section is not effective at the existing time due to top management policy that consider safety priority in last order of (cost, time, quality, safety), in addition to the limited resources, absence of safety culture, and lack of adequate training.

Accidents Details for	「able (1) r Construc	tion Sites	/ Iraq <sup>[9]</sup>	
Years	2005	2006	2007	2008*
Total No. of accidents	133	77	71	57
Accidents % in the public sector	55%	38%	77%	86%
Accidents % in the private sector	45%	62%	23%	14%
Analyzed accidents %	38%	74%	100%	100%
Fatal accidents %	2%	32%	15%	18%
Non fatal accidents %	98%	68%	85%	82%
Fracture accidents %	22%	18%	20%	32%
Injury accidents %	8%	16%	15%	12%
Burn accidents %	64%	14%	6%	4%
Amputation accidents %	2%	11%	4%	2%
Asphyxia accidents %	6%	-	1%	-
Electricity shock accidents %	-	-	1%	11%
Dislocation accidents %	22%	-	-	2%
Bruise accidents %	2%	-	4%	26%
Others accidents %	2%	9%	13%	11%

Table (4)

\*Data are up to the first of June.

#### **10-3 CHECKLIST DESIGN AND APPLICATION**

The design of the checklist is based on the literature and field survey of the research. Interviews were made with a selected number of well-experienced engineers in the field of safety working in the (NCHOS). Interviews were made with, deputy director general,

factories, planning, and piles department managers, and the head of environment and safety section of Al-Rasheed state contracting construction company to get the required information of the checklist.

Two weight scales were selected according checklist design to evaluate the percentage degree of application for each practice in the checklist, the weight of yes is equal 1 while no equal zero.

## **11. ANALYZING AND EVALUATING THE EXISTING SYSTEM**

Percentage of application was calculated and discussion was made for each part of the system:

## 11-1 ACCIDENTS RECORDS ANALYSIS

As shown in table (1) we can see that, analyzed numbers of application forms of occupational accidents were less than the received numbers in the years 2005 and 2006 due to its incomplete information which leads the center to neglect them. The big fire accident in one of the oil project was the cause of the high burns accidents percent in year 2005. Violence activities in 2006 were behind the increased percentage of fatal accidents. The percentage of non fatal accidents increases in 2007 and 2008 can be considered as the outcome of the increased volume of construction projects.

## 11-2 CHECKLIST ANALYSIS

The data of the checklist were analyzed and discussed, according to the parts sequence of the checklist, and based on measuring the percentage of application according to formula (1).

Percentage of application =  $(\sum X_I F_I / \sum F_I)^* 100\%$  .....(1)

Where:

X<sub>I</sub> is weight.F<sub>I</sub> is frequency.Figure (1) shows the percentage of application for safety parts.

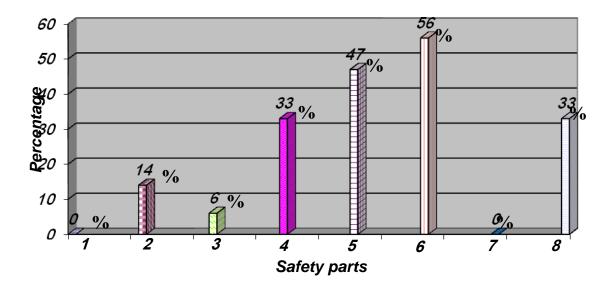


Figure (1) Percentage of application for safety parts

## 12 .DEFICIENCIES OF THE EXISTING SYSTEM

The discussion of results will focus on and point out the weak and strong areas of the system.

## 1. Part one: Top managements' perception about safety

Top management considers safety as luxury, and its emphasis is to achieve project within planned cost and time.

#### 2. Part two: Safety program documentation procedures

The results of this part highlight that Al-Rasheed state contracting construction company documents its safety program in term of program manuals only and didn't mention the last revision date. There is no interest of safety activities, records and updating.

#### 3. Part three: Safety policy and management support

There is no safety policy, objectives and goals which reflect inactive safety management support. Executive management doesn't take care of preparing and reviewing accident reports, safety statistics, inspection reports, pre-employment, post accident and random testing. Management doesn't consider safety as an aspect for pre-qualification of contractors.

#### 4. Part four: Safety training and orientation

Company considers training as cost element, for that the purpose of it in general is for promotion and little for education. Employees depend on their experience to achieve jobs and have an important subjects rather than safety to talk about it.

#### 5. Part five: Safety administration and procedures

From the results of this part we can conclude that there exist weak safety administration procedures. There is no commitment towards job site safety inspection, emergency procedures, hazardous work permits, preproject/task planning and the important matter there is no project safety committee.

#### 6. Part six: Safety work rules

Al-Rasheed state contracting construction company has work rules addressed more than half work practices, however certain areas like fall protection, electrical grounding, emergency procedures, communications, traffic control, vehicle safety, monitoring equipment, and up dating need further improvement.

### 7. Part seven: NCHOS inspections

There is no cooperation between (NCHOS) and the Iraqi construction companies, and the center is inactive due to lack of legislation that obliged companies to follow its advice concerning safety.

## 8. Part eight: Safety performance

The results of this part show a negative trend as to the measurement, evaluation and improvement of safety performance, and diagnose the absence of safety records keeping.

## 12. CONCLUSIONS

According to the aforementioned analyzing and evaluating the safety system of Al-Rasheed state contracting construction company, the following conclusions have been drawn:

- a. Management considers safety as priority four.
- b. Management doesn't have written safety field manual and documented responsibilities and authorities required for safety records.
- c. Lack of management support, and documentation of accidents and their reasons.
- d. Interest lack of employees training and developing their skills and education.
- e. There is no project safety committee to inspect job safety.
- f. Safety program doesn't include all the work rules, and practices.

- g. National center of health and occupational safety (NCHOS) is inactive due to their existing reorganizing process and lack of modified legislation.
- h. Management has no interest of safety performance.

## **13.RECOMMENDATIONS**

According to the aforementioned analyzing, evaluating, and the drawn conclusions, the following recommendations have been given to enhance the occupational health and safety management system:

- a. Management must demonstrate their leadership and commitment to safety so that employees understand that safety is job one.
- b. Documentation of safety program in terms of program manuals, field manuals and worker booklets, with periodical revision and assignment of responsibilities and authorities that concern safety activities and records.
- c. Providing and developing safety policy, objectives, goals and resources.
- d. Including safety factor to other required condition in pre-qualifying contractor.
- e. Accident reports, safety statistics, inspection reports, pre-employment, post accident, random and reasonable cost testing are important tools of monitoring, controlling and developing (OHSMS) performance.
- f. Employees need to be trained in the safe performance of their jobs, so they can effectively meet their responsibilities. Periodical safety training meetings for managers and supervisors are essential for evaluating training level and identification of training needs.
- g. Establishing safety committee for each project to identify, recommend and keep under review measures to improve the safe and health conditions at work.
- h. Ensuring that safety program and work rules are in place, implemented, and periodically reviewed to keep them up to date should any thing goes wrong on site.
- i. Activating (NCHOS) through legislation that organize its duties and creating cooperation environment links with construction companies to improve (OHSMS) performance.
- j. Ensure safety planning is a routine part of company work activities including review of task risk analysis prior to performing it.

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# CHECKLIST

	Part one: Top managements' perception about safe	ty	
No.	Description	Yes	No
1.	Is constructability a part of the planning process?		
2.	Is safety a part of the constructability review?		
3.	Does top-management discuss safety at all preconstruction and progress meeting?		
4.	Does top-management depend a formal incentive program?		
5.	Please rank in the order of importance (Cost, Time, S Quality)?	Safety,	and
6.	What is your perception about safety management in construction industry? (Value/Need/ Compulsion/ Unsure)?		-
	Part two: Safety program documentation procedure	es.	
No.	Description	Yes	No
7.	Do you have a written safety program manual? If yes, when was last revision date?		
8.	Do you have a written safety field manual?		
9.	Are all workers given a booklet that contains work rules, responsibilities, and other appropriate information?		
10.	Does company nominate employees whom responsible to document safety activities?		
11.	Does company identify responsibilities and authorities that concerning safety records?		
12.	Does safety records periodical updated?		
13.	Does company identify time period to keep safety records?		
	Part three: Safety policy and management support	t	
No.	Description	Yes	No

14.	Does company have a safety policy statement?		
15.	Does management provide necessary resources to achieve safety policy?		
16.	Does management set safety objectives and goals that compatible with policy?		
17.	Does management periodically review safety policy?		
18.	Do you have a disciplinary process for enforcement of your safety program?		
19.	Does executive management review accident reports?		
20.	Does executive management review safety statistics?		
21.	Does executive management review inspection reports?		
22.	Do you safety pre-qualify contractors?		
23.	Is safety part of your supervisor's performance evaluation?		
24.	Does company have personal protective equipment (PPE)?		
25.	Do you have a written substance abuse program for Pre- employment testing?		
26.	Do you have a written substance abuse program for Post accident testing?		
27.	Do you have a written substance abuse program for Random testing?		
28.	Do you have a written substance abuse program for Reasonable cost testing?		
29.	Does each level of management have assigned safety duties and responsibilities?		
	Part four: Safety training and orientation		
No.	Description	Yes	No
30.	Does company conduct safety orientation training for each employee?		
31.	Does company conduct site safety orientation training for		

			1
	every person new to the job site?		
32.	Are they given a test after they have received training?		
33.	Does your safety management system require safety training		
	meetings for each supervisor (foreman and above)? If yes,		
	how often? (Weekly/ Monthly/ Quarterly/ Annually)		
34.	Do you hold tool box/ tailgate safety meetings focused on		
	your specific work operations/exposures? If yes, how often?		
	(Daily/ Weekly)		
35.	Do you require equipment operation/certification training?		
36.	How often is safety training provided to employees (Weekl	y/ Mon	thly/
	Quarterly/ Annually/ only at the beginning)		
	Part five: Safety administration and procedures		
No.	Description	Yes	No
37.	Does your written safety program address administrative		
-	procedures of Emergency Procedures?		
38.	Does your written safety program address administrative		
	procedures of Accident?		
39.	Does your written safety program address administrative		
	procedures of Investigations/Reporting?		
40.	Does your written safety program address administrative		
	procedures of Training Documentation?		
41.	Does your written safety program address administrative		
	procedures of Audits/Inspections?		
42.	Does your written safety program address administrative		
	procedures of Record Keeping?		
43.	Does your written safety program address administrative		
	procedures of Hazardous Work Permits?		
44.	Does your written safety program address administrative		
	procedures of Safety Committees?		

	procedures of Substance Abuse Prevention?		
	•		
46.	Does your written safety program address administrative		
	procedures of contractor Prequalification?		
47.	Does your written safety program address administrative		
	procedures of Preproject/Task Planning?		
48.	Does your written safety program address administrative		
	procedures of Return-To-Work?		
49.	Do you have project safety committee?		
50.	Does safety committee conduct job site safety inspections?		
	If yes, how often? (Daily/ Weekly /Monthly)		
51.	Do these inspections include a routine safety inspection of		
	equipment (e.g., scaffold, ladders, fire extinguishers, etc.)?		
52.	Do you investigate accidents?		
53.	Do you perform rigging and lifting checks prior to lifting?		
	Part six: Safety work rules		
	i ait Sin. Saicty WOIN IUICS		
No.	Description	Yes	No
No. 54.	Description	Yes	No
_	Description	Yes	No
_	Description Do you periodically update work rules? If yes, when was the last update?	Yes	No
54.	Description Do you periodically update work rules? If yes, when was the last update?	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals         c. Fire Protection and Prevention	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals         c. Fire Protection and Prevention         d. Fall Protection	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals         c. Fire Protection and Prevention         d. Fall Protection         e. Electrical Grounding	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals         c. Fire Protection and Prevention         d. Fall Protection         e. Electrical Grounding         f. Emergency Procedures	Yes	No
54.	Description         Do you periodically update work rules? If yes, when was the last update?         What work practices are addressed by your work rules?         a. First Aid         b. Barricades, Signs and Signals         c. Fire Protection and Prevention         d. Fall Protection         e. Electrical Grounding         f. Emergency Procedures         g. Tools, Power and Hand	Yes	No

	k. Ladders and Scaffolds		
	I. Traffic Control		
	m. Personal Protective Equipment		
	n. Concrete Work		
	o. Environmental Controls and Occupational Health		
	p. Access-Entrances/Stairs		
	q. Site Sanitation		
	r. Respiratory Protection		
	s. Material Handling/Storage		
	t. Equipment Guards and Grounding		
	u. Trenching and Excavation		
	v. Vehicle Safety		
	w. Public Protection		
	x. Site Visitor Escorting		
	y. Monitoring Equipment		
	z. Equipment/maintenance		
	Part seven: NCHOS inspections		1
No.	Description	Yes	No
56.	Does company inspected by NCHOS in the last three years?		
57.	Were these inspections in response to complaints?		
58.	Does company receive application form of occupational		
	accident from NCHOS?		
59.	Does company fill the application form when accident		
	occurred?		
60.	Does company return back the filled application form to the		
	NCHOS?		
61.	Does company use information extract from application form		
	of occupational accident to make data base?		
L			

62.	Does company receive safety and health instruction of building and construction that NCHOS issued?		
	Part eight: Safety performance		
No.	Description	Yes	No
63.	Does company analyze task risks prior to performing it?		
64.	Does company use this analysis to make safety plan?		
65.	Does company work to achieve safety plan?		
66.	List your company's number of injuries for the three myears?	iost r	ecent
67.	List your company's number of illnesses for the three n years?	nost r	ecent
68.	List your company's number of fatalities for the three myears?	nost r	ecent