

## Enhancement of Current Procedures and Policies of OHS System in Iran Subway Construction through Developing an Auditing Tool

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**Abstract.** One of the most important aspects of health and safety approach is called an occupational, health, and safety management system (OHSMS), where deficiencies existing in its procedures and policies, especially in the construction industry, may cause negative consequences such as heavy life and investment losses. In this paper, comparison between Alberta's occupational, health and safety system as an acceptable standard and that of Tehran Urban and Suburban Railway Company (TUSRC), as a selected Iranian subway construction company, is carried out to identify deficiencies existing in TUSRC OHS policies. For this purpose, 68 basic criteria of successful OHS systems comprising eight categories are identified. This criterion through literature review and interviews with OHS professionals and an auditing tool was established. A questionnaire survey was conducted in selective case studies to find weak points in the current OHS system. Based on these findings, "Hazard identification and assessment" and "Hazard control" were identified as the most important categories. From statistical analysis the two categories which could not get acceptable values in TUSRC are "Hazard control" and "Program administration". At the end, a list of remedial action plans is recommended in order to enhance the examined OHSMS which could be helpful in similar cases. (Overview of Best Practices in Occupational Health and Safety in the Healthcare Industry 2009 ), (Occupational Health and Safety Act - Occupational Health and Safety Code 2009)

**Keywords:** OHS, Construction, Auditing Tool, OHSMS, Hazard

### 1. Introduction

Safety programs, like an Occupational Health & Safety Management System (OHSMS), are one of the best proactive approaches in improving site safety performance (Hislop 1991). The program elements currently found in the partnerships in health and safety OHSMS standards include management, leadership, commitment, hazard identification and assessment, hazard control, workplace inspections, worker competency and qualifications, emergency response, incident reporting and investigation, program administration, which could be considered as the success criteria of any organization in health and safety.

The survey was only done in health and safety departments in subway construction, as one of the most hazardous construction job sites in Iran in order to find deficiencies existing in the company's OHS system. Moreover, many reviews have been done in order to list deficiencies found in other cases around the world.

### 2. Literature Review

Anton (Anton 1989) defined a safety program as "the control of the working environment, equipment, processes, and the workers for the purpose of reducing accidental injuries and losses in the workplace". OHSMS is including management commitment and leadership, written policies, roles, responsibilities, worker participation, training, measurement of performance, and identification of required action to ensure continuous improvement (Different Standards 2010).

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Effective safety management is both functional (involving management control, monitoring, executive and communication sub-systems) and humanizes (involving leadership, political culture sub-systems paramount to safety culture) (Glendon, Clarke and F.McKenna 2006).

In Alberta, OHSMS standards include the commitment of the management to worker health and safety, hazard identification, developing a workplace inspection policy, choosing qualified worker by employer, using effective response management system, identifying root causes of the incident and investigating underlying problems that may lead to future similar incident to other workers. The major benefit of good OHS in Alberta is cost reduction and the other benefits are: improved patient safety, increased recruitment and retention of skilled workers, keeping workers at work and also improved morale.

Even if the hazards have been identified, system needs to develop a strategy to eliminate or reduce the exposure to the risk, and keep improving OHS procedures by: communicating with people in the workplace about OHS activities, making sure that OHS is integrated into all management procedures, evaluating the success of the control strategies, seek advice from employees to check if they feel the control strategies are working and whether there are any problems with the OHS programs, and strong commitment to OHS from management (Six steps to Occupational Health and Safety 2007 ). Research has shown that in Iran, there is little study in the area of OHS management system in construction industry. The potential of hazard is high and lack of safety and environment management system may cause negative consequences such as human resource and investment loss. In our report, we have to compare the implementation of OHS in one the biggest Iranian subway construction companies and the Government of Alberta in Canada.

### 3. Research Methodology

In this research, the identified criteria of successful OHS system of Alberta's OHS system as an accepted standard were weighed and an auditing tool was provided. At the next level, a questionnaire survey was conducted to gather rate of each criterion in the target company by using this auditing tool.

#### 3.1. Identify Criteria and Auditing Tool

Basic criteria of successful OHS system are identified from comprehensive literature review and Alberta's OHS standard is used as a benchmark. Ultimately, eight categories and a total of 68 criteria were identified. In order to perform comprehensive analysis, the weight of each category and the criteria of OHS standard and also minimum acceptable audit scores had to be determined. For this purpose, additional literature reviews and interviews were conducted with five OHS managers and supervisors of TUSRC. The results of an auditing tool determined as a successful achievement when a minimum audit scores of 70% overall and at least 60% in each category and its criteria were obtained. Categories and their Weights are shown in Table 1.

Table 1: Identified categories with their Weights

ID	Categories	Weight
A	Management leadership and commitment- components of an effective system	11%
B	Hazard identification and assessment- components of an effective system	17%
C	Hazard control- components of an effective system	16%
D	Work place inspection- components of an effective system	10%
E	Workers competency and qualification- components of an effective system	10%
F	Emergency response plans- components of an effective system	11%
G	Incident reporting and investigation- components of an effective system	13%
H	Program administration- components of an effective system	12%
Total		100%

#### 3.2. Prepare Questionnaire and Data Collection

Results for this paper were based on a questionnaire survey and quantitative approach to identify and confirm gaps between two systems. A questionnaire was developed based on eight categories and their sub-criteria. A total of 100 questionnaires were sent out for the survey and 48 completed questionnaires were

returned after two weeks, representing an overall response rate of 48 percent. Ten out of the total respondents were the OHS experts while eighteen were engineers, eight managers, and twelve operators. On average they have nine years experience.

### 3.3. Data Analysis

For reliability test of the questionnaire, Cranach's Alpha coefficient is calculated by Statistical Package for Social Sciences (SPSS) version 17. Cranach's Alpha coefficient which was calculated is about 0.88 (>0.75) that shows the successful implementation of the survey. In data analysis, Multi Attribute Value Theory (MAVT) has been used to determine the score of the case study. The values of each category are shown in Table 2 and the final value of for the eight categories is shown in Table 3.

Table 2: Values of each category

ID	Criteria A	W	M	ID	Criteria E	W	M	ID	Criteria D	W	M
A1	OHS policy	13%	9	E1	Requirements position	13%	6.8	D1	Workplace policy	11%	7
A2	Safe working procedures	30%	7.6	E2	Selection process	13%	5.8	D2	Roles	4%	6
A3	Enforcement	17%	6.6	E3	Hire program	13%	5.8	D3	Inspections	4%	7
A4	Safety culture	8%	6.2	E4	New staff	12%	6	D4	checklist	7%	8
A5	Management commitment	12%	7	E5	Training	12%	6.6	D5	Workers role	11%	7
A6	Workers' participation	8%	6.2	E6	Managers' tasks	8%	6.4	D6	Training	7%	6
A7	Adequate resources	12%	6.8	E7	Training records	4%	5.6	D7	Risk classification	7%	6
ID	Criteria B	W	M	E8	New equipment	13%	6	D8	Corrective actions	11%	7
B1	Job inventory	17%	7.6	E9	Training programs	4%	4.8	D9	Action accountabilities	7%	6
B2	Hazards identification	17%	7.4	E10	Training needs	8%	5.2	D10	Corrective action mechanism	12%	6
B3	Hazards evaluation	33%	7	ID	Criteria F	W	M	D11	Reports	4%	7
B4	Workers involvement	5%	5.2	F1	Potential emergency	20%	7.4	D12	Hazards report process	4%	7
B5	Access to records	3%	6.2	F2	Emergency response	30%	8	D13	Timely hazard correction	7%	5
B6	Training	5%	7.2	F3	Plan	13%	7.2	D14	preventative maintenance	4%	6
B7	Hazard review	17%	6.2	F4	Managers' roles	13%	6.8	ID	Criteria G	W	M
B8	Results communication	3%	5.6	F5	Regular drills	6%	7.4	G1	Incidents requirement	15%	8
ID	Criteria C	W	M	F6	Employees, training	6%		G2	Standard form	7%	8
C1	Workers involvement	7%	5.2	F7	Emergencies reports	6%	6.4	G3	Notice to reporting by managers	13%	7
C2	Training	10%	6.2	F8	First aid	6%	7	G4	Notice to reporting by workers	6%	6
C3	Hierarchy of controls	45%	6.2	ID	Criteria H	W	M	G5	Root cause analysis	13%	6
C4	Controls, accountabilities	7%	5.6	H1	Mechanism	40%	5.8	G6	Corrective actions	20%	4
C5	Review	21%	5.1	H2	Contractors' issues	5%	6.8	G7	Workers involvement	13%	5
C6	results communication	3%	2.5	H3	Management participation	5%	6.2	G8	Effective training	13%	6
C7	New workers aware	7%	5.6	H4	OHS records	9%	7.2				
				H5	Leading and lagging indicator	18%	4.8				
				H6	OHSMS auditing & action plans	23%	6.4				

Table 3: Final value of OHS system in TUSRC

ID	Categories	Weight	Value	Score= Weight*Value
A	Management leadership and commitment- components of an effective	11%	72.2	7.94

ID	Categories	Weight	Value	Score= Weight*Value
	system			
B	Hazard identification and assessment- components of an effective system	17%	68.88	11.71
C	Hazard control- components of an effective system	16%	57.16	9.19
D	Work place inspection- components of an effective system	10%	65.32	6.53
E	Workers competency and qualification- components of an effective system	10%	60.28	6.02
F	Emergency response plans- components of an effective system	11%	73.44	8.08
G	Incident reporting and investigation- components of an effective system	13%	61.34	7.97
H	Program administration- components of an effective system	12%	59.37	7.12
Total		100%	---	64.56

### 3.4. Findings

In this survey, the term “Not Applicable” was not selected by any of the respondents which mean all identified criteria were implemented in the company.

Eight categories and total 68 criteria were analyzed based on acceptable minimum score of 70% overall, and at least 60% in each category and its criteria.

- Category A: The overall value of category A is 72.2%. Values of all the criteria of this category are over 60%. Category B: The overall value of category B is 68.88%. Values of almost all the criteria of this category are over 60%. Values of B4, B8 is below 60% which are the weak points of this category.
- Category C: The overall value of category C is 57.16% which is below 60%. Values of almost all the criteria of this category are below 60% (C1, C2, C4, C5, and C7).
- Category D: The overall value of category D is 65.32% which is acceptable. The weak points of some criteria like D4, D6, and D13 are compensated by Values of criteria like D1, D8, and D11.
- Category E: The overall value of this category is 60.28%. Five out of ten criteria have value below 60% (E2, E3, E7, E9, and E10) which other criteria compensated these weak points.
- Category F: The overall value of this category and all of its criteria is 73.44% which satisfies the assumption.
- Category G: The overall value of this category is 61.34%. This category has two weak points (G6, G7).
- Category H: Category H has the overall value 59.37% which is not acceptable based on the assumption. The reason of its low value is weak criteria like H1, H5. Total score: Total score of OHS system in TUSRC based on the above eight categories are 64.56. Weak categories like C and H have considerable negative impact on the total score.

### 4. Conclusion

In this study, eight categories which are important in managing OHS system were identified. 68 criteria were extracted from these eight categories. The two most important categories among them were determined based on their weight. These two categories are “Hazard identification and assessment” and “Hazard control”. Based on statistical analysis two categories which could not get the acceptable value of 60% are “Hazard control” and “Program administration” by value of 57.16% and 59.37% respectively. Category E, Workers competency and qualification by total value of 60.28% can be considered as a weak category.

Weak criteria in Hazard control category are defined as C1, C4, C5, C6, and C7.

Reasons for weakness of this category can be determined as below.

- Employees are not involved in hazard control process effectively

- Developing controls which includes develop hazard control, implementation, and review and revise are not done efficiently.
- There is no constructive enforcement policy and consequently it is not communicated to the employees.

Weak criteria in program administration are questioned as H1 and H5. Reasons for weakness of this category can be explained below.

- Everyone is not involved in the Health and Safety Management System and there is no opportunity to give feedback on health and safety issues at the work site.
- There is no two-way communication at the site for health and safety meetings, training sessions, health and safety committee meetings, field-level hazard assessments, etc.
- All suggestions from workers are not recorded, and there is no recognition given of the worker's involvement and co-operation.

According to criterion H4, all OHS statistic records are kept in the organization but monitoring and analysis of these data are not conducted. Reasons for this deficiency are listed below.

- Leading indicator measurement which identifies the likelihood of an incident and also lagging indicators measurements which analyze the frequency, severity, and type of incidents are not implemented effectively.

Comparison between company's health and safety records to those of similar companies in the same industry are not carried out.

## 5. Recommendation

A text in TUSRC common continuous improvement cycle of managing OHS system is required. This continuous improvement cycle includes planning what needs to be done (PLAN), doing what has been planned (DO), assessing the work done (CHECK) and performing the work recommended to improve the system (ACT). Figure 1 depicts OHSM diagram.



Figure 1: OHSM cycle

However, existing progressive cycle consists of Plan, Do, Check, and Act stages are not managed acceptably based on the current OHS standards. The deficiencies which were extracted during the survey are evidence to this fact. According to weak points and defects, it is concluded that the company has problem in do and mainly check stages. Correction actions are not carried out properly and adequately. To enhance OHS management system, it is recommended to revise two categories identified as weak elements based on OHSM cycle and adjust priorities in resource allocation during Do and Check stages. It is also suggested that the company employ external partnership to improve Do and Check stages.

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