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# A Study on the Application Effect of Safety Patrol Management System (SPMS) in Construction Site

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**Abstract:** While Korea had achieved radical growth of construction industry, it also had accumulated problems in material, human recourse and economical loss due to its low quality of safety level. Therefore, not only corporations but also the nation is putting in a great deal of efforts for construction site by introduction of professional Safety Patrol Management System (SPMS) and consideration of its necessity. A construction site classified to A, B, C types based on Safety Patrol Management System (SPMS). In order to demonstrate the effect of Safety Patrol Management System (SPMS), we studied three factors, that Average numbers of indicated dangers and Safety accident incidences in each construction sites and Change in workers safety sense. In addition, the first factor and the third factor are subdivided to get more exact figure. The first factor, Average numbers of indicated in workers danger, was subdivided into Site management and Worker's state. The third factor, Changes in worker's safety sense, was also subdivided into Active behavior and Passive behavior. The result shows us that factors be changed sequentially caused by point of application of Safety Patrol Management System (SPMS). Through this, it will establish the suitable design standards and suggest the basic database for estimating disaster and accident ratio.

**Keywords:** Construction disaster & accident occurrence, Safety sense, Safety Management

## 1. INTRODUCTION

Our country has achieved a rapid economic growth thanks to the aid of the development of information technology and science over the past 20 years. However, as the dark side of the high-speed growth, construction safety accidents and diverse disasters such as the collapses of Seongsudaegyo Bridge and Sampoong Department Store frequently occur due to safety frigidity, and this has been causing the accumulation of problems of physical, personal and economic losses. In particular, due to the large-scale, complication and diversity of buildings, the construction industry has different and various risk factors according to the types of construction so that many safety accidents occur and accordingly, the preparation for cause analysis and countermeasures of construction disasters is urgently

required [1]. At present, various efforts such as physical support like offering of protective devices and performance of education on worker's safety sense through safety education activities during the construction period in construction sites are made, and some of construction sites adopts SPMS (Safety Patrol Management System) to prevent and manage site safety accidents.

The purpose of this study is to prove the effects of SPMS adoption by comparing and analyzing the average numbers of indicated dangers and safety accident incidences by construction type followed by SPMS adoption, investigating the trend of changes in worker's safety sense and examining the change in the numbers of indicated dangers and safety accident incidences [2].

## 2. CONCEPTION OF SPMS

SPMS prevents potential disasters in the construction site in advance. It also detects harmful and risk factors that might bring disaster and eliminates them. By doing so, it introduces much safe and desirable construction environments to the labors and the company to enhance the performance. SPMS is a system that has the purpose of confirming and removing adverse risk factors in construction sites and preventing construction safety accidents in advance, and through this, prepare for pleasant site atmosphere to improve the construction site worker's safety and the productivity of a company [3].

This Table displays the purpose check-lists of SPMS.

## 3. ANALYSIS METHOD AND DETAILS

This study investigated the actual monthly average numbers of indicated dangers and safety accident incidences in construction sites to analyze the accident incidence trend in construction sites by construction type. Besides, a questionnaire was conducted to analyze the change trend of the worker's safety sense followed by SPMS adoption.

The numbers of accident incidences by construction type are the data from investigating the industrial disasters between the date of construction start and that of construction completion, and the indicated numbers are the data from

investigating sites about risk factors and the non-compliant and careless behavior toward to worker's safety regulations. When SPMS is adopted, in case of exposure of safety regulation non-compliance and careless behavior, it should be rectified and site education should be performed, and in case of discovery of risk factors or potential accident incidence factors, the situation should be reported and the risk factors should be removed in advance. In case of non-adoption of SPMS, only indicated cases for discovery of safety regulation non-compliance, careless behavior and risk factory were recorded, and beside temporary site supervision and corrective order, potential risk factors were not positively improved.

Category	Contents
1) Entrance Management	Issuing passes, gate controlling, updating workers to each business system
2) Safety Education and Physical Examination	Educating safety on new and previous workers, restricting access to the uneducated and unhealthy.
3) Support Administration	Filing day work reports and safety reports.
4) Traffic Control and Management	Controlling entering cars and parking lots.
5) Heavy Equipment Management	Managing caution signs around the equipment and setting up the safety radius.
6) Construction Site Patrol Management	Managing on-site risk factors, providing first-aid as needed.
7) Concierge	Providing field guidance to the visitors and managing the workers.

Fig. 1. Applicability of SPMS

The data investigated by the site safety manager was utilized for the indicated cases for discovery of safety regulation non-compliance, careless behavior and risk factors.

The contents of the questionnaire were indicated as the two categories of basic safety sense and site safety compliance sense and the questionnaire questions were indicated as 'category-question number.' The level of answers to each question was from ① to ⑤ and when the answer is close to ⑤, the safety sense means high safety sense.

Construction Sort	A-type	B-type	C-type
Temporary Work	Unapplied	Apply	Apply
Earth·Foundation Work	Unapplied	Apply	
Frame Work	Apply	Unapplied	
Closing Work	Apply	Unapplied	

Fig. 2. Sort according to SPMS applied time

4. RESULTS

4.1 ANALYSIS OF A-TYPE

In case of the adoption of SPMS, it was found that the numbers of indicated cases decreased and the actual fatal accidents did not occur. The safety sense also increased in general.

Type		Construction Sort			
		T. W	E · F. W	F. W	C. W
Apt.	Death	0	0	0	0
	Injury	0	1	1	0
	Indicated	272	475	384	225
Culture	Death	0	1	0	0
	Injury	1	0	1	1
Assembly	Indicated	301	511	395	242
Research	Death	0	0	0	0
	Injury	1	1	1	0
	Indicated	246	439	366	210

Fig. 3. Comparison of A-type data

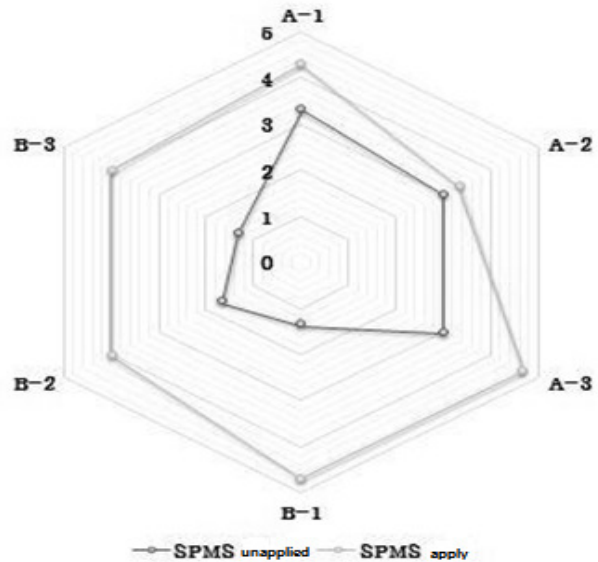


Fig. 4. Change of Safety sense

4.2 ANALYSIS OF B-TYPE

In case of non-adoption of SPMS, the numbers of designated increased. Furthermore, it was found that in case of adoption of SPMS, the actual fatal accident did not occur but after withdrawal of SPMS, 3 fatal accidents occurred in frame work.

Type		Construction Sort			
		T. W	E - F. W	F. W	C. W
Apt.	Death	0	0	0	0
	Injury	0	0	2	0
	Indicated	224	367	459	266
Culture	Death	0	0	1	0
	Injury	0	2	2	0
Assembly	Indicated	231	424	559	283
Research	Death	0	0	2	0
	Injury	0	1	1	0
	Indicated	219	394	593	288

Fig. 5. Comparison of B-type data

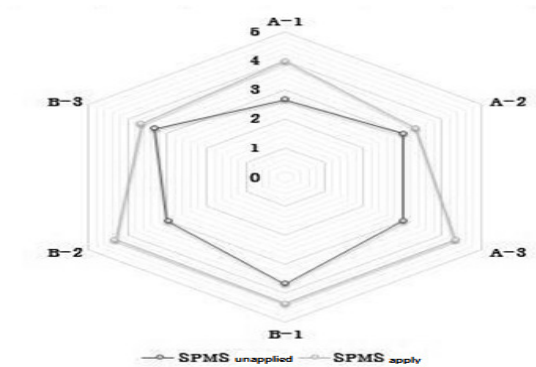


Fig. 6. Change of Safety sense

4.3 ANALYSIS OF C-TYPE

As a result of adoption of SPMS to the whole construction types, compared to other types, the numbers of indicated cases and fatal accidents and the incidence rates of injury and death were low. In addition, the safety sense was higher than A-type and B-type.

Type		Construction Sort			
		T. W	E - F. W	F. W	C. W
Apt.	Death	0	0	0	0
	Injury	0	1	0	0
	Indicated	233	388	397	257
Culture	Death	0	0	1	0
	Injury	0	1	1	0
Assembly	Indicated	210	376	437	246
Research	Death	0	0	0	0
	Injury	0	0	2	0
	Indicated	182	311	332	209

Fig. 7. Comparison of C-type data

5. CONCLUSIONS

This study analyzed the construction types that have higher accident incidence rates in construction sites and the effects of SPMS on construction sites, and as a result, following conclusions could be derived.

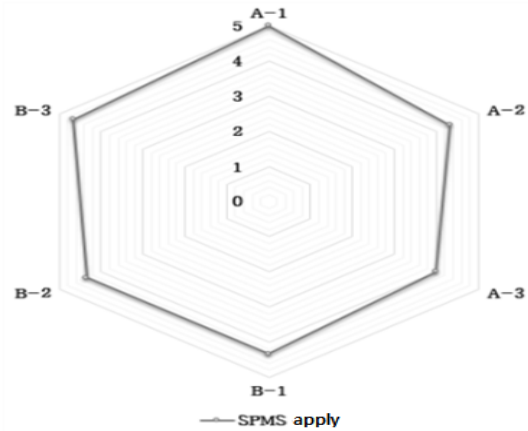


Fig. 8. Change of Safety sense

First, in case of adoption of SPMS to construction sites, the probability of an accident incidence rate becomes lower than the existing construction sites. It is considered that this is because a professional safety management system manages construction sites more systematically and removes potential accident incidence factors in advance.

Second, it is known that adoption of SPMS played a role in reducing the numbers of indicated cases, death and injury accidents, and accordingly the worker’s safety sense level is high. It is believed that adoption of a professional and systematic management system at the early stage of construction can reduce safety accidents and raise the worker’s safety sense.

In order to reduce the accident incidence rate in construction sites, DB should be implemented based on site accidents and management data, and a system that can predict the accident incidence trend and incidence probability should be prepared, and not a simple management but a professional safety management field and system should be developed. Moreover, for improving the change of the worker’s sense, trust and communication between managers and workers are required and this is considered to be feasible through adoption of SPMS.

REFERENCES

- [1] Zohar, D.; Luria, G. The use of supervisory practices as leverage to improve safety behavior: A cross-level intervention model, *Journal of Safety Research*, 34(5), 2003: 567-577
- [2] Sig Y.; Kang. A Model for the Priority Evaluation of Prevention Factors and Strategies by the Cause Analysis of Industrial Accident, *Journal of the Korea Safety Management & Science*, 2008, Vol.10, No.1.
- [3] Cooper, M.D. Exploratory Analysis of the Effects of Managerial Support and Feedback Consequences on Behavioral Safety Maintenance, *Journal of Organizational Behavior Management* 2006.