

# Analysis of Improvement Methods of Safety Management Guidelines with Design for Safety

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**Abstract:** Despite all efforts to reduce construction disaster, construction site accident rate has steadily increased in Korea since 2008. As a different approach from traditional research, there is a growing issue about design for safety concept to prevent construction disaster. The notion is that construction worker's safety need to be considered at design phase, not only at construction phase. Globally, the notion has been noted that to improve the safety of the worker and used in practice. However, in Korea, most of safety management guidelines are limited to construction phase. From recent statistics, only 1.4 percent of designer feel responsible for safety accident at construction site. In this circumstance, this research find out safety guidelines through literatures reviews and practical experience of safety management in other country which apply design for safety concept. Selected guidelines are verified by survey which is evaluated with risk, function, cost, time and aesthetic view categories. Through the survey, define guidelines which could be effectively applied in Korea. By using proposed safety guidelines for design phase, preventing construction accident and improving designer's recognition of safety issue at design phase are expected.

**Keywords:** Safety Management, Construction accident, Design for Safety, Design Phase, Safety Guideline, Construction Hazard Prevent through Design

## I. INTRODUCTION

Construction industry remains second hazardous industry in Korea in terms of the aggregate number of fatalities, 26.61% following 29.13% of manufacturing industry [1]. Death and disaster rate of whole industry shows steadily decreasing trend, but death and disaster rate of construction industry is still increasing. National efforts for construction disaster prevention facilities with various safety improvements were involved recently. Despite efforts to improve the working environment of a construction site, accident rate in the country since 2008 has steadily increased in Korea.

One of a growing issue to prevent construction site accident is Construction Hazard Prevent through Design (CHPtD). CHPtD is defined as the consideration of construction site safety in the design of a project. One analysis suggests that 60% of construction accidents could have been eliminated, reduced, or avoided with more thought at the design stage [2]. OSHA which is a federal agency of the United States that regulates workplace safety and health strongly believes that it is as appropriate for the agency to require that avoidable safety hazards as it is for local jurisdictions to set design criteria for the safety of the building's occupants [3]. A more recent study of 100 construction site accidents found that changes in the permanent design elements could have reduced the accident 47 the accidents [4].

However, Design for safety concept is not easy to apply in construction industry. Because the accident happened at the construction phase, designer already finished their work so there is an ambiguous of responsibility. In fact, differences of viewpoint may arise

when distributing responsibility between contractors and builders, designers (Fig. 1). Furthermore, one statistic shows 1.4% of designer only have responsibility of safety on construction site in Korea [5].

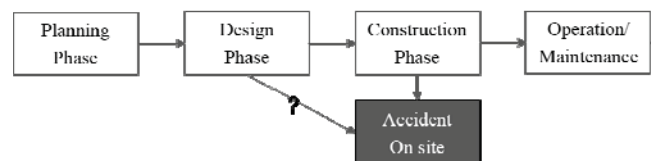


Fig. 1. Responsibility relationship

Through reviewing numerous case of foreign literature, this paper will find out the standard guidelines to designer at design phase with the Design for safety concept in Korea. By assessing the effectiveness of guidelines with survey, investigate the standard guidelines that can be applied in practice by using a questionnaire and interviews. The selected standard guidelines will cover safety issue, excluding health.

## II. LITERATURE REVIEW

### A. Construction Safety management in Korea

Lot of Safety management rule is legislated as Table 1 [5], [6]. Also some other system are exist such as incentive, using safety check list and penalty. However, almost all of the legislation and system are limited at the construction phase. In manual of safety management, it said designer have to consider construction safety. (1) Eliminate potential risk factors, (2) Design decreasing possibility of risk factors within a range of keeping functional and

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aesthetic design. However, it does not suggest strict guideline. Also the responsibility is not imposed to designer.

TABLE I  
 SAFETY MANAGEMENT LEGISLATION

Phase	Safety management
Design phase	Construction law - Consider Building structure and material composition Fire defense regulation
Construction phase	Occupation Safety and Health acts - Hiring Safety manager - Taking Safety education - Improving Construction site condition - Facilities safety inspection - Planning safety management Construction technology promotion law - Organizing safety management organization
Operation & Maintenance phase	Special Act on the Safety Control of Public Structures - Planning safety and maintenance of Public Structures - Safety inspection Fire defense regulation

B. Construction Safety on the Designer in other countries

U.K.'s Construction Design and Management (CDM) Regulations, impose a duty on the designer to make sure that any prepared design avoids possible risk to construction workers [7]. In Australia, Construction Hazard Assessment Implication Review (CHAIR) process (WorkCover) is developed by construction industry and government. This design for safety tool review and provide a precise and systematic solution with safety management at the design phase [8]. Also, it is suggested that how the design for safety concept might be incorporated into the building codes and standards, and the OSHA.

III. SURVEY FOR GUIDELINES

A. Research Process through Survey

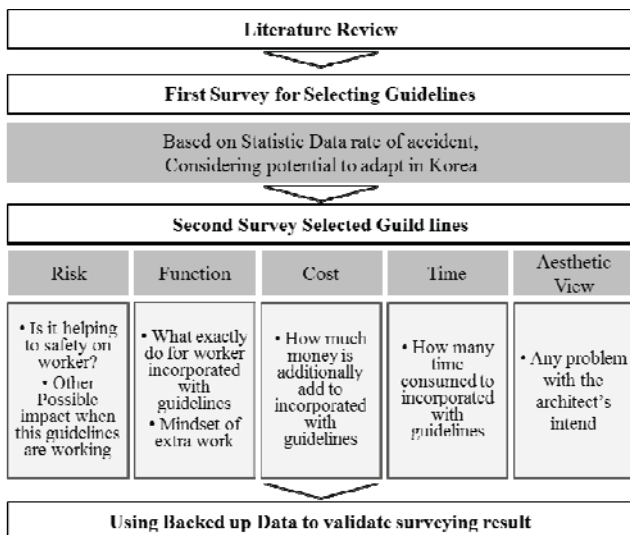


Fig. 2. Research Process

In this research survey will be conducted twice. Process of survey is Fig. 2.

B. Research Process through Survey

The participants of first survey are who really work at the site. For example; worker, safety management employer and an expert who has an experience at the site safety issue related with selected standard. Those survey will contain the questions about feasibility of adaptation in construction site in Korea. Purpose of second survey is estimating efficiency of guidelines. It is estimated by five categories, risk, function, cost, time and aesthetic view. The participants of second survey will divided two groups. Risk and function factors are asked to construction workers. Designer, Engineer who consider cost and time for design is the participants of cost, time and aesthetic view factors survey. It will be backed up by existing data of cost and time analysis.

IV. CONCLUSION

This research considers Design for safety which related with worker's safety on site during construction phase. It suggest the needs of adaptable standards for practical way in Korea from abroad literature for construction safety issue and survey.

This paper suggested standard guidelines might increase potential safety design on construction phase. Also, designer's recognition of improvement when they do design at design phase will expected. Through further research, the guidelines for safety management with design for safety concept will be established. More precise research, reliable analysis for survey is needed.

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REFERENCES

- [1] Ministry of Employment and Labor, "current Status of the Industrial Accident", 2013..
- [2] European Foundation. (1991). From drawing board to building site, European Foundation for the Improvement of Living and Working Conditions, HMSO Books, London.
- [3] Korman, R., 1999. Undeserved attention. Designers say OSHA is unfairly expanding safety responsibility without clear legal basis. Engineering News Record 21 (June), 28-32.
- [4] Gibb, A., Haslam, R., Hide, S., & Gyi, D. "The role of design in accident causality." In:Hecker, S., Gambatese, J., and Weinstein, M. (Eds.) Designing for Safety and Health in Construction: Proceedings from a Research and Practice Symposium, September 15 - 16, Portland, Oregon, 2004. pp. 11-21.
- [5] Park, Chun sik, "A study on Sense of Obligation Improvement of Construction Accident.", 2013. Seoul National University of Science and Technology, MS thesis.
- [6] Kim, Ki-aeng et al. "A study on Preventing Disasters at Construction Sites by Implementing Environmental Color Planning, Architectural Institute of Korea, No. 26, Vol 1, 2006, 26-27.
- [7] Mackenzie, J., et al. "Communication: The Key to Designing Safety." Proceedings of the Designing for Safety and Health Conference. London:ECI,2000. 77-84.
- [8] Hecker, Steven, Gambatese, John, Weinstein, Marc. "Designing for Worker Safety", Professional Safety 50.9 (Sep 2005): 32-44