ICCREM 2018

Innovative Technology and Intelligent Construction

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Edited by
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Geoffrey Q. P. Shen; and

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Preface

We would like to welcome you to the 2018 International Conference on Construction and Real Estate Management (ICCREM 2018). Harbin Institute of Technology, Louisiana State University, Hong Kong Polytechnic University, University of Alberta, Luleå University of Technology, Heriot-Watt University, Marquette University, Karlsruhe Institute of Technology, Guangzhou University. The Conference is a continuation of the ICCREM series which have been held annually since 2003.

The theme for this conference is "Innovation Technology and Intelligent Construction". It especially highlights the importance of innovation technology for construction engineering and management. The conference proceedings include 138 peer-review papers covered fourteen important subjects. And all papers went through a two-step peer review process. The proceedings of the congress are divided into four parts:

- Innovative Technology and Intelligent Construction
- Sustainable Construction and Prefabrication
- Analysis of Real Estate and Construction Industry
- Construction Enterprises and Project Management

On behalf of the Construction Institute, the American Society of Civil Engineers and the 2018 ICCREM Organizing Committee, we welcome you and wish you leave with a wonderful experience and memory at ICCREM 2018.

Professor Yaowu Wang
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Contents

On-Site Safety Uncertainties Assessment of Construction Based on Cloud Model and Fuzzy Sets Theory

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ABSTRACT

Safety uncertainties widely exist in every phase of construction projects, especially during the on-site building stage. To identify different kinds of on-site safety uncertainties, a four-level analytic hierarchy process (AHP) model is proposed based on China's current construction industry standards. Then analyze the influence and frequency of level-4th (L4) factors, synthesized cloud model (SCM) is applied to sampling calculation program, with which both randomness and fuzziness can be jointly considered. Finally, a multi-factor assessment method (MAM) under fuzzy sets theory is used to assess level-3rd (L3), level-2nd (L2), and level-1st (L1) factors of on-site safety system. Such methodology not only avoids the limitation of filling in huge numbers of written documents, but also can realize the dynamic adjustment of system factors, and may significantly decrease the difficulty of on-site safety management and safety inspection. In addition, practical advices are put forward to avoid some limitations of standard.

INTRODUCTION

More often than not, uncertainties are inherent in every condition of building engineering projects (Tam et al. 2004). During different construction stages, these projects may consist of various safety uncertainties, most of which will contribute to unacceptable hazards, such as threaten to people health, failure of mechanical equipment and damage to environment. Also in the same construction stage, safety uncertainties may exist in different dimensions, like on-site, off-site and coordination (Arashpour et al. 2017). According to statistical analysis of safety accidents in China (Acebes et al. 2014), including but not limited to falls, contact with electricity, injured by falling/swinging objects, hit by rolling/sliding/flying object, contact with machinery/equipment moving parts, fire or explosion (Pinto 2014), large scale of which occurred in on-site dimension. In order to control the on-site built activities and reduce potential accidents, both government and contractors have spared no efforts to inspect regularly or irregularly on safety conditions, which may require more and more investment in human and material resources. The classical method of identifying the ranks of on-site safety conditions of projects in China is to fill-out a safety inspection score summary table that contains nearly 10 sub-tables, from which more than 500 factors must be carefully taken into inspectors' considerations and