Rapport de veille n° 33

BIM

31/03/2022

Objectif : *L'utilisation du BIM en phase de conception et de ses potentiels applications pour la prévention des risques*

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.

Table des matières

1. Références anglophones

1.1 Articles scientifiques

Automatic identification and quantification of safety risks embedded in design stage: a BIM-enhanced approach [PDF]

X Xiahou, K Li, F Li, Z Zhang, Q Li, Y Gao - Journal of Civil Engineering and Management, 2022, Volume 28, Issue 4, 14 p.

DOI : https://doi.org/10.3846/jcem.2022.16560

Design stage plays a decisive role in safety risk management of the whole life cycle for construction projects. However, existing research mostly pay attention to post-accident management and lack pre-management consciousness. Based on the concept of design for safety (DFS), this paper explains how design optimization can enhance the safety performance for construction projects. Firstly, use accident causality theory and trajectory crossing theory to clarify the logical relationship between safety accidents and design process. Then, identify risk sources of safety accidents in deep foundation pit of subway projects and form a safety management knowledge base. Thirdly, based on design and review rules in the knowledge base and improved FEC risk quantification method, quantify the design oriented subway construction safety risks. Finally, use BIM secondary development technology to realize automatic examination and visualization of safety risks. A case study was conducted to verify this research framework. This paper can be a supplement to the existing risk management theoretical research.

1.2Conférence / Ouvrage / Thèse

Digital Twin in Construction Safety and Its Implications for Automated Monitoring and Management

M Shariatfar, A Deria, YC Lee - Construction Research Congress 2022

DOI : https://doi.org/10.1061/9780784483961.062

With construction sites being dynamic and unstructured in nature, the safety of workers at a job site has always been a major concern for project managers, who often assign a significant portion of project resources and manpower for maintaining safety protocols. The current manual methods used for safety surveillance at a job site are not only laborious but also time-consuming and prone to human error, leading to numerous accidents at sites each year. This study proposes a new approach that employs a digital replica of a construction safety surveillance system capable of providing real-time safety analyses and predictions based on site conditions. A digital twin system developed in this study allows for real-time communication with a construction site facilitating safety managers in a decision-making process. The system encompasses three primary resources: (1) 4D BIM models, (2) cloud computing and database platforms, and (3) real-time field data captured by sensors and processed by artificial intelligence techniques. The proposed system is expected to improve real-time safety surveillance through identification of various site conditions and prediction of possible safety concerns.

The Concept of Digital Twin for Construction Safety

J Teizer, KW Johansen, C Schultz - Construction Research Congress 2022

DOI : https://doi.org/10.1061/9780784483961.121

“Digital twins” as models for information-driven management and control of physical systems have emerged over the past years in multiple industrial sectors and recently also in construction. However, in the domain of construction safety, a digital twin remains undefined, with little or no consensus among researchers and practitioners of two essential aspects: (1) the connection between the physical reality of a construction site (the

“physical” twin) and the corresponding computer model (the “digital” twin), and (2) the most effective selection and exploitation of real-life data for supporting safe design, planning, and execution of construction. This paper outlines the concept for a Digital Twin for Construction Safety (DTCS), defining three essential steps in the digital twin workflow: (1) safe design and planning for hazard prevention, (2) risk monitoring and control for proactive prediction and warning, and (3) continuous performance improvement for personalized- or project-based learning. DTCS should be viewed as a system-based approach enhancing the overall safety performance rather than exclusively integrating sensing information or safety knowledge in Building Information Modeling (BIM) for safety purposes. The result is an outline of our vision of the DTCS and a description of its components. Additionally, we point toward future research on the topic.