An Investigation of Critical Factors and Constraints for Selecting Modular Construction over Conventional Stick-Built Technique

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Abstract

Recent advances in manufacturing methods, construction equipment, information technology tools, and project delivery systems have resulted in increased use of prefabrication and modularization. This research study identifies critical factors and constraints that can help designers, engineers, and constructors in selecting modular construction over the conventional "stick-built" technique for commercial building projects. The decision-making process of selecting one construction method over another is complex and based on a number of factors, some of which are site conditions, skilled labor availability, transportation conditions, organizational readiness, local codes, project schedule and budget, sustainability requirements, and design complexity. The aim of this study is to identify the most critical factors and constraints that must be considered by the decision-makers for selecting modular or stick-built construction. The study employed a mixed methods research design and was divided into three phases. In the first phase, through an in-depth literature review and interviews with six industry professionals, ninety seven decision-making factors and forty three constraints were identified. In the following phase, a questionnaire survey was conducted to determine their quantitative ratings and rakings. In the final phase, with the help of a focus group of five modular construction experts, twelve critical decision-making factors and six major constraints were shortlisted and validated. It is hoped that the findings will help the Architecture, Engineering and Construction (AEC) industry in making informed decisions about the appropriate construction method selection.

Keywords: manufactured construction; mixed methods research; model-driven prefabrication; modular construction; productivity

BIM Experiences and Expectations: The Constructors' Perspective

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Abstract

Building Information Modeling (BIM) applications are being rapidly embraced by the construction industry to reduce cost, time, and enhance quality as well as environmental sustainability. As a result many construction firms are gaining experience with these new tools and processes and changing their expectations from university graduates. As many construction programs strive to deliver curriculum and research that is relevant to the industry, it is essential to accurately understand the impact of BIM on the operations and practice of construction companies. Accordingly, this study benchmarks the current status of BIM implementations, organizational structures, training requirements, and strategies of construction companies and examines their expectations from university construction graduates in regard to BIM knowledge and skills. An online survey was devised to understand the current level of BIM expertise and strategies of construction companies and their expectations. The survey invited national and regional U.S. construction companies with a presence in the mid-Atlantic area. The findings of this study support the fact that BIM is growing as an important component of construction operations and provide a benchmark to measure the evolution of BIM practice in construction firms over time and across different sectors. The study provides important insights that inform university construction curricular efforts.

Keywords: BIMBIM competencyBIM educationBIM toolscontractors' BIM experience

Maximization of Fly Ash in the Manufacture of Reinforced Concrete Pipe

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Abstract

Fly ash produced as a by-product of coal combustion in electric power plants is used in many commercial processes. The quantity of fly ash available, however, continues to outweigh its commercial applications. Current practice commonly specifies replacement of up to 25% of the required cement with Class C fly ash in the manufacture of reinforced concrete pipe (RCP). RCP sections with higher percentages of Class C or Class F fly ash were manufactured using the "packerhead method" and were subjected to external load crushing strength tests using the three-edge bearing test method. Results indicate that RCP manufactured with 40% Class F fly ash and up to 65% Class C fly ash meet ASTM C 76M external crushing strength standards for Class I-III RCP.

Lean Construction: Experience of US Contractors

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Abstract

With the construction industry plagued with inefficiencies, Lean provides opportunities to identify and eliminate wastes in the construction processes and make them more efficient. Companies utilizing Lean have reported several benefits: improved reliability of outcome and profit margin, higher quality construction, greater customer satisfaction, and reduced costs and improved schedules. However, much of the current literature centers on the theories and benefits of Lean, with minimal attention to contractors' experience. Increased familiarity and knowledge about Lean among the contractors and other stakeholders are vital as Lean construction practices are highly collaborative and need a culture change. To realize the improvement of efficiency of the construction industry, a widespread adoption of Lean is necessary. To gain insight on contractors' experience with Lean, a survey was conducted among the top 200 contractors of the United States listed by Engineering News-Record(ENR) through an online survey of structured questions. The findings of this study support the fact that Lean is growing as an important component of construction operations and provides benchmarks to measure the evolution of Lean practice in construction firms over time and across different sectors. This study provides important insights that inform the practitioners about the experience and level of Lean familiarity.

Keywords: Lean construction; lean experience; contractors lean experience; lean practices