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A Review on Critical Risk Assessment of Prefabricated Constructions During Renovation and Alterations

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Abstract: *Prefabricated and modular construction has gained increasing attention due to its potential to enhance construction speed, quality control, and sustainability. However, the adoption of prefabrication in renovation and alteration projects introduces distinct and complex risks arising from interactions between existing structures and newly manufactured components. Despite extensive research on risk management in modular construction, quantitative assessment of critical risk factors specific to renovation and alteration contexts remains limited. This literature review systematically examines existing studies on risk management practices, quantitative and probabilistic risk assessment models, safety risks, design and production uncertainties, digital and BIM-based tools, and sustainability-related risks in prefabricated construction. The review reveals that most studies rely on qualitative or expert-based approaches, focus on isolated project stages, or are validated through limited case studies. A significant research gap is identified in the development of integrated, quantitative frameworks that can rank and prioritise critical risks during prefabricated renovation and alteration projects, particularly in emerging construction markets. This review establishes the foundation for future empirical studies aimed at developing data-driven risk assessment models to support informed decision-making and effective risk mitigation strategies.*

Keywords: Prefabricated construction; Modular construction; Renovation and alteration; Quantitative risk assessment; Critical risk factors; Construction risk management

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