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Integrating BIM and FEM Tool for Design of Non-Prismatic Member to Minimize Connection and Bracing

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Abstract: *The integration of Building Information Modelling (BIM) and Finite Element Method (FEM) tools is transforming structural engineering design workflows, particularly for complex geometries such as non-prismatic members. Non-prismatic members, characterized by varying cross-sections along their length, are increasingly used in modern structural systems for their material efficiency and aesthetic appeal. However, their design presents challenges in accurately modelling their behaviour and optimizing their performance. This study explores a methodology that seamlessly integrates BIM and FEM tools to enhance the design process of non-prismatic members. The proposed approach leverages the parametric modelling capabilities of BIM to define non-uniform geometries and exports this data to advanced FEM software for structural analysis and optimization. A case study of a real-world project demonstrates the efficiency of the integration in terms of reducing design iteration cycles, improving material utilization, and achieving structural performance targets. The research emphasizes the potential of BIM-FEM integration to bridge the gap between architectural intent and structural feasibility. The findings contribute to the development of a robust workflow for designing non-prismatic members, thereby addressing critical challenges.*

Keywords: Building Information Modelling, BIM, Finite element Method Tool, FEM, Non-Prismatic Member, Structural Optimization, Parametric Design.

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