

An integrated structural topology optimization framework for the design of high-rise buildings

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1. Abstract

Topology optimization is becoming increasingly popular in the field of civil engineering; however, research in the development of this technology for the design of high-rise buildings demands further attention. Thus, this work contributes to improve this application by describing an integrated topology optimization approach involving the concurrent optimization of both continuum (polygonal) and discrete (beam/truss) finite elements to design structural systems in high-rise buildings. By incorporating both types of elements, the overall design process is simplified and improved. For instance, after the locations of the outer skin or shell of a high-rise building and its columns are determined, topology optimization can be used to design the internal structural system, while concurrently sizing the members. Several practical examples are given to show the importance and relevance of this work to the structural design industry for a variety of objective functions, including compliance, buckling and combinations thereof.