

Matrix analysis of modular systems for vertical expansion

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Increasing the efficiency of the footprint of existing buildings instead of constructing new ones involves adding rooftop extensions to residential structures in urban areas, optimizing existing architecture. Given the constraints of some buildings due to their age, the approach relies on prefabricated, lightweight modular systems. These systems are eco-friendly, they optimize energy and material use, and they offer social benefits by creating new housing in an inner city environment.

The paper specifically focuses on volumetric modular units, a type of prefabricated construction, where components are produced in controlled environments and then assembled on-site. This contrasts with traditional building methods of on-site construction, offering benefits in terms of efficiency and quality.

The paper establishes criteria to assess the suitability of different modular systems for vertical expansion, considering factors such as material use, structural systems, efficiency, flexibility, time, costs and sustainability. A 3x3 matrix supports scoring these systems, ultimately identifying the best options for increasing building height.

Steel portal frame and cross-laminated timber panel systems emerge as top choices, recognized for their robust structural response and adaptability.

