

Designing strategies for Topological Interlocking Assemblies in architecture. Flat Vaults

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Abstract

The modular interlocked blocks in flat structures are known in ancient buildings with pure-compression constructions. Over the last two decades, this structural bond has become relevant, studied by mechanical engineers, and material scientists due to the properties and design freedom that modular structures have. The structural hierarchy existing in topologically interlocked structures enhance the performance, allowing to design and fabricate custom block elements. The main reason to consider this system is that, from the architectural perspective, it is composed by identical modular elements, and it discretizes flat or curved surfaces into elements that work only by contact and compression. This article presents preliminary studies for its application and different approaches for designing discrete interlocked assemblies with a focus on the application for architectural structures: studying the structural performance of contact analysis and introducing the combination of topological interlocking with different structural principles.

Keywords: Topology, interlocking, vaults, patterns, pure-compression, post-tensioned.

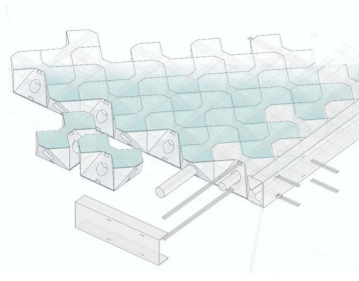


FIG2. New interpretation of traditional interlocking assemblies.

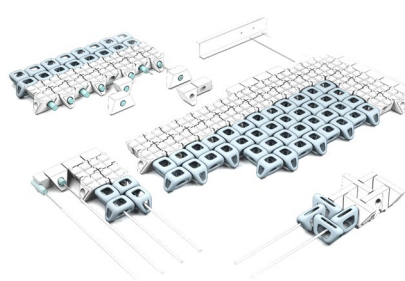


FIG1. Post-tensioning flat vault structure.

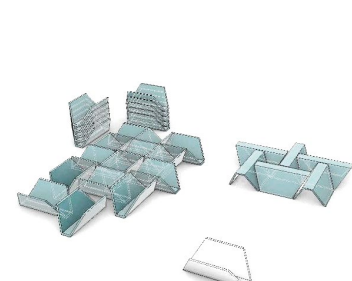


FIG3. Lightweight structure with interlocked shells.

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