

## Hidden Strength in Historic Buildings

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## 1. Abstract

Abstract

Most historic buildings include structural materials and systems that are in some way obsolete. This can range from materials no longer available (first-growth timber) to those no longer considered safe in modern codes for new use (cast-iron columns). There is a large class of buildings that contain systems that are no longer used but are safe in use; because these systems are not used in new buildings, they are not discussed in current code.

This paper reviews three obsolete structural systems that have a history of good performance and that have more capacity than ordinary modern analysis would suggest. First, terra-cotta tile arch floors are known to be strong themselves for their expected (gravity) loading, but can also, through pseudo-composite action, strengthen the wrought-iron or steel beams supporting them. Second, draped-mesh (catenary) floors have a load capacity defined by their reinforcing, but have shown to be stiffer than expected because of multiple load paths within the slabs. Finally, the heavy masonry curtain walls typical used with steel-frame buildings before 1920 provide alternate load paths, additional stiffness, and additional capacity for lateral loads. The presence of these systems can mean that historic buildings are stronger than we think.

**Keywords:** floor systems; bearing wall; resilience; terra cotta, draped-mesh.