A computational approach to the static of masonry vaults reinforced with composite materials

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Abstract

A tensegrity procedure is used to design to the minimal mass of tensile reinforcements of masonry structures with arbitrary shapes [1]-[2]. The proposed strengthening methodology allows for the design of minimal mass resisting mechanisms of systems formed by a network of masonry rods, mainly working in compression, and grids of tensile reinforcements. It creates a minimal mass output of the strengthened model, which can be observed as lumped stress network and connect model of the exanimated structures [3]-[4].

Assuming a perfectly plastic response by each member, the existence of such resisting mechanisms ensures that the reinforced structure is stable under the examined loading conditions, due to the safe theorem of the limit analysis of elastic-plastic bodies.

The approach includes an explicit determination of the state of pre-stress to be applied to tensile reinforcements, in order that they are effective under pre-existing loading conditions. Different numerical examples show the potential of the proposed approach in designing minimal mass FRP/FRCM reinforcements of masonry vaults and domes, which are aimed at preserving sufficient 'cracking-adaptation' capacity of the reinforced structure.

Keywords: **Composites, masonry structures, tensegrity**

References

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