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Masonry vaulted staircases: Interpretation of equilibrium paths (Conference Paper)

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Abstract

The subject of the stairs organized according to a typology improperly referred to as "cantilever stairs" requires a remarkable insight. In that its equilibrium is based on a complex interaction of forces. This is displayed in a three-dimensional context and can be recognized only after some highly refined numerical analyses. In the present paper a simplified interpretation of the equilibrium mechanism of such stairs is investigated, derived from a qualitative elaboration of some numerical result available in the literature, suggesting a path for approximate structural control based on a suitable one-dimensional model of the flight of stairs. © Civil-Comp Press, 2012.

Author keywords
Cantilever stairs, Equilibrium paths, Masonry, Roman stairs, Tension stresses, Vault

Indexed keywords
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Masonry Vaulted Staircases: Interpretation of Equilibrium Paths
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Keywords: masonry, vault, cantilever stairs, roman stairs, tension stresses, equilibrium paths, reinforcement.

Summary
The study of masonry buildings is a complex field because any element of the fabric has an own behaviour, deeply influenced, for example, by the shape of the structure, different building materials or any discontinuity, which usually represents a constraint altering the specific response of the single element and acting a series of chain reactions. This study belongs to a larger research project [1,2,3] using both a theoretical approach and some laboratory tests for the optimal theoretical solution of masonry buildings.
This paper provides details of an analysis of the distribution of the stress field and the equilibrium path that is developed for a particular type of masonry stairway such as the "half-barrel" or "cantilever" or "roman" stairways. This typology is largely found in Italian ancient masonry buildings and for their complexity [4] these structures, or similar, are usually studied in a three-dimensional, with the support of computer.