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On the statics of masonry helical staircases (Conference Paper)

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Abstract

This paper illustrates a course of action for analysis and verification, based on the classical equilibrium limit conditions, of a particular structural element, as the helical staircase. The static analysis is the basic approach for every numerical models which may provide more detailed results successively. In the final part of the paper some samples are shown to understand the problem approach and the solution. © Civil-Comp Press, 2011.

Author keywords
Bearing capacity; Equilibrium problems; Helical staircase; Masonry; Stairs; Stress conditions; Torsional solution

Indexed keywords
Course of action; Equilibrium limits; Equilibrium problems; Helical staircase; Masonry; Stress conditions; Structural elements
Engineering controlled terms: Bearing capacity; Computer aided engineering; Environmental engineering; Masonry materials; Teaching
Engineering main heading: Stairs

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On the Statics of Masonry Helical Staircases

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Keywords: masonry, stairs, helical staircase, stress conditions, equilibrium problems, bearing capacity, torsional solution.

Summary
In this paper a simplified interpretation of the equilibrium mechanism for helical stairs is investigated, derived from a qualitative elaboration of some numerical results available in the literature, suggesting a path for approximate structural assessment based on a suitable one-dimensional model of the stairs flights.
The masonry is not effective in sustaining tension stresses and bending, and the stairs should work as a cantilever, or however as an incomplete arch-vault which lacks the counter-thrust from the missing part of the arch. This contradiction cannot be simply solved by means of plane analysis, but by exploring three-dimensional equilibrium paths accounting for the space articulation of such structural systems, searching stress fields in equilibrium and compatible with the resistant abilities of the masonry material.