The spiral staircase in the fortified tower of Nisida

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ABSTRACT

This contribution is part of a larger study on the island of Nisida (Naples) and its architectures, that has been conducted by the authors for several years now in collaboration with a research group at the Department of Architecture of University of Campania "Luigi Vanvitelli". The work previously proposed constitutes a state of progress of the current knowledge on the architectures present on the island, in particular on the cylindrical tower (with the original paths to access it) and on the buildings of the Institute for Juvenile Justice (IPM) [1]. By comparing the data taken from the historical iconographic sources with those derived from the architectural and structural surveys, it has been possible to advance a number of hypotheses on the modifications of the cylindrical tower (placed on the highest part of the island) and of the buildings that belong to IPM [2]. The small spiral staircase found in the inner back side of the circular tower is part of this study. This spiral staircase, whose diameter does not exceed 2.20 m, can be seen as an unrolled ribbon of extreme proportionality and architectural accuracy despite its small size, and its helical movement shows the ability reached by masters of stonemasonry in the realization of one of the main element in the building composition of space. The research focuses on studying the structural behaviour of the spiral-shaped masonry stair of the Tower of Nisida, with a circular plan and a central circle, in the framework of Limit Analysis. García Ares (2007) demonstrates for the first time the static equilibrium of this type of constructions (helical-shaped stairs) from the point of view of Limit Analysis [3] and, some years later, Block (2009) analyses them by using the Thrust Network Analysis [4]. The present article deals with this issue by following the same approach shows by García Ares and by applying the principles of Limit Analysis as exposed by Heyman for masonries [5]. Through the equilibrium approach, which can be considered the more suitable for the study of masonry structures, and the application of the slicing technique combined with the graphic statics, one of the equilibrium solutions of this construction has been found. The analysis also demonstrated that the geometry and proportion of the spiral stairs play a fundamental role in their structural behaviour by deepening the conceiving process that allowed to the construction of such splendid artefacts.

REFERENCES


