






Constructive and structural analysis of a Baroque dome in Spain.

The encamonada dome


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Abstract

The Basilica of St. Juan de Dios in Granada was built between 1734 and 1757; it is considered to be one of the great works of the Baroque architecture in Spain. This paper presents an architectural and constructive analysis of the dome over the transept; it was built according to the faux vault model divulged by Fray Lorenzo de San Nicolás (encamonada dome). We present an accurate geometric modeling of the dome and its constructive system, obtained from an on-site data collection campaign. This paper presents various hypotheses regarding the structural behavior of the filling in the extrados of the timbrel vault, according to its morphological characterization. The study of historical construction is presented through the application and contrast of different structural analysis methodologies: the experimental Guastavino's formulation, the analysis of stability by applying the slicing technique within the frame of Limit Analysis, and a new methodology based on funicular and projective geometry to determine efforts combinations in equilibrium. Finally, it presents conclusions about the combined use of them.

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Section snippets

Introduction, objectives and methodology

The Basilica of San Juan de Dios is regarded as a benchmark in Baroque Spanish Architecture, by both national [1], [2], and international authors [3]. This paper presents a geometrical and constructive model of the dome over the transept, along with a structural analysis of the inner brick dome.

From a bibliographic and documental study, including a compilation of historical archives [4], and the analysis of similar domes from the same period, it has been established an approximation of the...

Architectonic characteristics

The Basilica was built between 1734 and 1757, and until the present day has remained largely unchanged [3], with the exception of some minor renovation works that were carried out in 1913 and 1994 (and which are mentioned in this article).

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