New lightweight structures and historical heavyweight structures in conservation

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ABSTRACT

The field of conservation of the built environment deals with a large gamut of structures. This richness of structures is continuously growing in the last centuries and nowadays it includes as well many structures with advanced technologies. These structures become more and more relevant to the conservation field. One important group of structures is the group of lightweight structures, in their contemporary meaning.

Indeed, lightweight structures always existed in the history of the built environment and different examples like tents, canopies, and other lightweight shelters can be brought. In parallel, designers and builders always aspired to lighten the weight of structures even when dealing with heavyweight structures. But in the last eras, different scientific engineering and technological developments enabled to lighten the weight of structures in an outstanding manner, creating great challenges to the conservation field. Various examples of these challenges are the integration of new lightweight structures with historical heavyweight structures, the conservation of aging lightweight structures, lightweight strengthening intervention in heavyweight historical buildings, pedagogical issues of lightweight structures and conservation, etc.

In spite of the importance and relevancy of lightweight structures to the field of conservation, most efforts of research and practical activities focus on historical heavyweight structures, since naturally, many of the historical structures are still heavyweight structures. In the current situation there is a great necessity to focus more on lightweight structures in the conservation field, in parallel to historical heavyweight structures.

This research focuses on one of the challenges in the issue of lightweight structures and conservation when there is a need to use a new lightweight structure in a heavyweight historical conservation context. Especially today in the digital era that enables the application of very innovative technologies, those new lightweight structures can be designed as outstanding and unique ones. The results can be a mixture of new complex geometries, new advanced materials, in different variations together with the heavyweight historical structures. Accordingly, in this research, a theoretical framework which relates to engineering and architectural aspects is introduced, identifying different types of lightweight structures and their combinations with historical heavyweight structures along time, including their roots and characteristics, their developments in our digital age, and their different applications. This research is one of the efforts to enlarge the theoretical knowledge as a basis for developing the broad field of lightweight structures and conservation.

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