

Design criteria and procedures for archaeological shelters: towards flexibility thanks to algorithmic modelling

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ABSTRACT

Many examples of archaeological shelters can be found, both physically, over archaeological sites, and theoretically, in literature. However, only a few have passed through a proper assessment of their effectiveness, which is mainly due to proper detailing of the building solution in respect of general conservation criteria. Furthermore, in some cases, shelters have proven to worsen environmental conditions of what they are supposed to protect [1].

In this paper, based on a wide literature review, design criteria for archaeological shelters are proposed, in respect of the three main themes recognized as crucial: general architectural quality, conservation effectiveness, structural and functional detailing [2].

To deal with the wide range of cases where such criteria must be applied, an innovative tool providing the desired flexibility in the design procedure is taken into consideration. Algorithmic modelling in Grasshopper environment, a plugin for Rhinoceros 3D software, offers the required features thanks to a linear workflow, where the general characteristics of the structure as long as its structural details can be implemented [3]. Every element is represented by a set of parameters in the plugin rather than a single object in the 'parent' modelling tool, thus allowing to change easily the design. Other plugins provide additional tools for specific tasks, such as finite element analysis, safety verifications and structural optimization [4].

The paper presents the methodology for the implementation of the entire workflow and the preliminary assessment of its results, from the structural and architectural point of view, showing good adaptability to several possible design choices (position of pillars, truss number, roof pitch, etc.). Structural optimization is also performed. The future implementation of environmental parameters (e.g. daylight, ventilation, temperature), as an additional set of restraints, will complete the framework on which final assessment will take place.

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