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Sustainable Design for Building Envelope in Hot Climates: A Case Study for the Role of the Dome as a Component of an Envelope in Heat Exchange

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Abstract : Architectural design is influenced by the actual thermal behaviour of building components, and this in turn depends not only on their steady and periodic thermal characteristics, but also on exposure effects, orientation, surface colour, and climatic fluctuations at the given location. Design data and environmental parameters should be produced in an accurate way for specified locations, so that architects and engineers can confidently apply them in their design calculations that enable precise evaluation of the influence of various parameters relating to each component of the envelope, which indicates overall thermal performance of building. The present paper will be carried out with an objective of thermal behaviour assessment and characteristics of the opaque and transparent parts of one of the very unique components used as a symbolic distinguished element of building envelope, its thermal behaviour under the impact of solar temperatures, and its role in heat exchange related to a specific U-value of specified construction materials alternatives. The research method will consider the specified Hot-Dry weather and new mosque in Baghdad, Iraq as a case study. Also, data will be presented in light of the criteria of indoor thermal comfort in terms of design parameters and thermal assessment for a“model dome”. Design alternatives and considerations of energy conservation, will be discussed as well using comparative computer simulations. Findings will be incorporated to outline the conclusions clarifying the important role of the dome in heat exchange of the whole building envelope for approaching an indoor thermal comfort level and further research in the future.

Keywords : building envelope, sustainable design, dome impact, hot-climates, heat exchange
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