

A GREEN APPROACH FOR THE INTEGRATION OF PHASE-CHANGE MATERIALS IN BUILDING ENVELOPES IN HOT ARID COUNTRIES

KARIM M. AYYAD¹ & INES M. BAAZIZ²

¹Asst. Lecturer of Green Architecture, Dept. of Architecture, Faculty of Engineering, October University for Modern Arts and Sciences, 6 October, Egypt

²Asst. Lecturer of Material Mechanics, Institut Préparatoire des Etudes d'Ingénieurs de Tunis (IPEIT).
Université de Tunis, Tunisia

ABSTRACT

There has always been a great gap between the use of natural materials to create buildings with improved environmental performance and the mainstream construction market which is always on the side of using artificial conventional materials. Until recent scientific research has succeeded to introduce and test materials which can act like natural clay and stone in the sense of thermal capacity and conductivity and yet practical enough to be used in the conventional manner of building. These materials were called the phase-change materials (PCMs).

However, the previous studies for PCMs have regularly marginalized the link between natural PCMs and the natural setting and diagnosis of the area of interest. Thus, this work aims at presenting an overview of the key researches in the field of use of PCMs in buildings and presenting a green approach for their uses in building envelopes with specific implementation on the case of hot arid countries. This is achieved by analyzing key works of choice and implementation of PCMs in buildings from a green perspective to use of their findings and re-adjust them for application in hot arid countries. Consequently, this paper proves that the use of certain green techniques combined with natural PCMs available in the immediate context can be very beneficial in the sense of reaching buildings with acceptable environmental and thermal performance. The research outcomes imply developing certain green building techniques and materials new to hot arid countries. However, the research findings are applicable only where the bioclimatic diagnosis of the area of the designated case and its natural resources coincide with those expressed in this work. This research is limited by the to-date advancements in PCM manufacturing technologies. It represents a new approach, yet a series in the chain of efforts for the integration of PCMs in building envelopes.

KEYWORDS: Phase-Change Materials (Pcms), Green Architecture, Building Envelope, Heat Transfer, Architecture in Hot Arid Countries.