World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:9, No:12, 2015

Three Types of Mud-Huts with Courtyards in Composite Climate: Thermal Performance in Summer and Winter

Authors : Janmejoy Gupta, Arnab Paul, Manjari Chakraborty

Abstract : Jharkhand is a state located in the eastern part of India. The Tropic of Cancer (23.5 degree North latitude line) passes through Ranchi district in Jharkhand. Mud huts with burnt clay tiled roofs in Jharkhand are an integral component of the state's vernacular architecture. They come in various shapes, with a number of them having a courtyard type of plan. In general, it has been stated that designing dwellings with courtyards in them is a climate-responsive strategy in composite climate. The truth behind this hypothesis is investigated in this paper. In this paper, three types of mud huts with courtyards situated in Ranchi district in Jharkhand are taken as a study and through temperature measurements in the south-side rooms and courtyards, in addition to Autodesk Ecotect (Version 2011) software simulations, their thermal performance throughout the year are observed. Temperature measurements are specifically taken during the peak of summer and winter and the average temperatures in the rooms and courtyards during seven day-periods in peak of summer and peak of winter are plotted graphically. Thereafter, on the basis of the study and software simulations, the hypothesis is verified and the thermally better performing dwelling types in summer and winter identified among the three sub-types studied. Certain recommendations with respect to increasing thermal comfort in courtyard type mud huts in general are also made. It is found that all courtyard type dwellings do not necessarily show better thermal performance in summer and winter in composite climate. The U shaped dwelling with open courtyard on southern side offers maximum amount of thermal-comfort inside the rooms in the hotter part of the year and the square hut with a central courtyard, with the courtyard being closed from all sides, shows superior thermal performance in winter. The courtyards in all the three case-studies are found to get excessively heated up during summer.

Keywords : courtyard, mud huts, simulations, temperature measurements, thermal performance
Conference Title : ICSAUD 2015 : International Conference on Sustainable Architecture and Urban Design
Conference Location : Bangkok, Thailand
Conference Dates : December 17-18, 2015