Assessment of the effect of building materials on indoor comfort and energy demand of residential buildings in Jos: An experimental and numerical approach.

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Abstract

Air conditioning accounts for a significant share of the overall energy consumed in residential buildings. Solar thermal gains in buildings account for a significant component of the air conditioning load in buildings. This study compares the solar thermal gain and air conditioning load of a new proposed building design with a typical conventional building in the climatic conditions of Jos, Nigeria, using a combined experimental and computational method using TRNSYS software. According to the findings of this study, the new design building's annual average solar thermal gains are lower compared to , the reference building's average solar heat gains . The study case building's decreased solar heat gain is mostly attributable to the somewhat lower temperature of the building zones because of the greater building volume and lower fenestration ratio (ratio external opening area to the area of the external walls). This result shows that the innovative building design adjusts to the local climate better than the standard conventional construction in Jos to maintain a suitable temperature within the building. This finding means that the air-conditioning electrical energy consumption per volume of the new proposed building design will be lower than that of a conventional building design.