{'title': 'Effect of seasonal temperature on the heat transfer through a building envelope',

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'abstract': 'The main objective of this work is to study the heat transfer through the exterior walls of an administrative building in Errachidia City. A numerical simulation by COMSOL software was made to analyse the impact of introducing three thermal insulators (air, hemp wool and glass wool) on the heat transfer through the building’s exterior walls in a winter period from January 1st to 8th, 2020. The physical model analyses wall layers’ temperature. It depends on the indoor and the outdoor temperature, solar radiations, and the thermal properties of the building’s envelope.',

'key\_findings': "The results show that the air gap is a good thermal insulator, it acts as a damper of temperature and heat flow. The study found that in Errachidia city, a semi-desert climate, the decrease in heating and cooling energy consumption can be achieved by choosing the south-east orientation and using red bricks with a medium of air gap with a thickness of 5 cm as the envelope of the building. Insulation, including materials like cellulose fiber, air gaps, and mineral thermal insulation panels, has a positive impact on maintaining stable temperatures, thus improving inhabitants' comfort and reducing energy consumption. Specifically, in Morocco, roof insulation and external wall insulation with air gaps significantly reduce heating requirements in hot and dry climates. The results show that the temperature change through the different layers of the wall, which is constituted by a double-layered of hollow clay brick and various thermal insulators from January 1st to 8th, 2020, indicates a high ability of hollow clay bricks to store heat. The three types of insulators under study behave as a thermal barrier, preventing heat from exiting. Specifically, the internal insulator layer's (glass wool and hemp wool) temperature changes from 18°C to 19°C, while its external side temperature varies from 7°C to 18°C. Additionally, the thermal insulation by air-gap proves an interesting thermal resistance in comparison with other studied thermal insulators. Figure 3 presents the heat flows in terms of different thermal insulators’ thicknesses during four times per day (7h, 12h, 19h, and 23h). The registered flow is maximal at 12h, minimal at 7h, and it changes from 20 W/m² to 30 W/m², between 19h and 23h. The heat flow attains a measure of 52 W/m² at 12h at the external side and it reaches 22 W/m² at 23h, it means that the temperature gradually decreases towards the inside of the insulation with a value of 4 W/m². Furthermore, the heat flow has a linear curve in the external layer of the brick, but with different values depending on the different moments of the day. At 12h, the heat flow is the highest compared to another time. And finally, the flow becomes almost invariable at the insulating layer. The study found that in a semi-desert climate with cold winters, thermal insulation by air gap is more effective compared to hemp wool and glass wool. It prevents heat from escaping, thereby ensuring thermal comfort, reducing energy consumption, and lowering material costs.",

'limitation\_of\_sota': '',

'proposed\_solution': "The paper evaluates the external walls temperature of an administrative building in Errachidia City and analyses the effect of insulation (air, glass wool, and hemp wool) on heat transfer through the building's external walls during a winter week. The study uses COMSOL-Multiphysics software, based on the finite element method, to simulate the model.",

'paper\_limitations': ''}