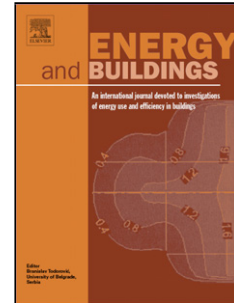


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Thermal performance of a nearly zero energy passive house integrated with the air-air heat exchanger and the earth-water heat exchanger

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Abstract

This paper presents an investigation carried out for evaluating the dynamic thermal performance of a residential house using a multi-zone building model simulated with the help of TRNSYS 17. The building model integrates systems such as an air-air heat exchanger (AAHE), a water-air heat exchanger (WAHE) coupled with an earth-water heat exchanger (EWHE). The temperature based control strategies for these systems are recommended based on the simulation results. The AAHE and the EWHE have impact of 66 % and 7 % respectively on reduction of the annual heating consumption of the house. All the integrated systems together contribute significantly (72 %) in reducing the annual heating consumption of the house. The annual heating consumption of the house per unit floor area is estimated as 6.9 kWh/(m²year) which is within the passive house standard. There is significant reduction of the overheating time above 25°C due to the EWHE installed in the present house with annual ventilation air cooling contribution of 602.6 kWh/year.

Keywords: Heating consumption, earth-water heat exchanger, overheating, ventilation, air tightness.

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