Effectiveness of the earth tube heat exchanger system coupled to a space model in achieving thermal comfort in rural areas

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The aim of this work is to investigate by modelling the possibility of reducing the operational energy of a typical house without negatively affecting its embodied energy. This is done through consideration of different building materials coupled with the use of an earth to air heat exchanger (EAHE) for fresh air supply and cooling. For known indoor and outdoor conditions and for given building materials (thermal capacity and conductance), a ventilation controller determines the amount of flow rate needed to temperate the indoor air temperature to achieve thermal comfort. Different wall configurations are assumed for each of the living zone and the bedroom zone of the apartment. It is found that the use of an optimal wall configuration in each zone coupled with the EAHE results in 76.7% energy savings compared with the reference case with conventional cooling.