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NUMERICAL INVESTIGATION OF THE THERMAL BEHAVIOUR OF EXTERNAL MULTILAYER WALLS TO ENSURE THE BUILDINGS RETROFITTING THERMAL INSULATION

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Abstract

In recent years, summer temperatures have significantly exceeded the averages recorded in preceding decades. The increased use of air conditioning has driven up global electricity demand, primarily due to the inadequate thermal insulation of buildings. This study aims to propose a solution for retrofitting existing buildings to enhance thermal insulation, thus reducing energy consumption. To achieve this goal, a numerical program was developed to analyze heat transfer through multilayer walls made from various materials and thicknesses. The program utilized the average outdoor temperature in July as a boundary condition. Simulations were conducted for both typical building construction materials in an Algerian city and proposed insulation materials. The results indicate that current construction methods provide poor insulation, while the proposed solutions offer significant improvements in thermal insulation across all scenarios. For example, with a 15 cm wall thickness, the proposed insulation materials led to a 4°C decrease in internal temperature, while for a 30 cm wall, the decrease was 2.5°C. Additionally, it was observed that good thermal insulation could be achieved with thinner walls. These proposed solutions offer enhanced energy efficiency, resulting in reduced electricity consumption and greenhouse gas emissions.

Key words: buildings retrofitting, multilayer wall, saving energy, thermal insulation

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