Potential Energy Saving By Using 3d Printed Lightweight Concrete Walls Of A House In Australia

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The development of building designs is increasingly challenging to provide thermal comfort at the minimum energy costs due to climate changes and sustainability concerns. In this study, a 3D printed lightweight concrete wall was developed and compared against the currently used materials in a typical house in Australia. Seven different mix designs including two different lightweight aggregates with consideration of printability requirements have been produced and thermal and mechanical properties of printed samples have been evaluated. The results showed that increasing the lightweight aggregates by up to 80% volume of sand could decrease the thermal conductivity by up to 60%. The effect of materials and 3D printed wall design in selected 3-, 6-, and 8-stars buildings in different locations in Australia, have been analyzed by Energy Plus software to assess the cost savings, peak demand reductions, payback period of materials versus energy savings and discomfort reduction. The results confirmed the efficiency of lightweight 3D printed concrete walls in energy saving of houses.