

# Assessing indoor temperature control using different materials and designs

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**Abstract.** Controlling indoor temperature in buildings is gaining much importance. This is attributed to the increasing awareness around the world of the mandate reduction in fossil fuel consumption to produce electricity necessary to control temperature inside buildings. This research studies the potential to improve the indoor environment of buildings using different materials either insulators or incorporated inside a building and façade design. The study involves phase changing materials (PCM), thermal insulation materials and façade shading and design. Thermal insulation materials include mineral wool and polystyrene boards, which are the most popular insulators in arid countries. Wood cladding influence on the indoor temperature is also studied. To investigate the effect of facade design on the indoor temperature, two shading devices are used; horizontal and vertical shading elements and a combination of both. Furthermore, the effect of window to wall ratio on the indoor temperature is also studied. To conduct the investigation, an experimental simulation for a 1:5 scaled 3mx3mx3m room is performed. The effect of solar heat is simulated using a sun simulator. Different combinations are investigated to develop guidelines for the engineers to foster the incorporation of materials/design combinations to reduce the users' dependency on the active techniques to control indoor temperature.

