

# Contribution of Thermal Insulation in Reducing the Cooling Load for Iraqi Building

**Dr. Jamal H. Waheb**

Lect. Mechanical Engineering Dept., University of Anbar

[jamalwaheb@yahoo.com](mailto:jamalwaheb@yahoo.com)

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## Abstract

In tropical zones, like Iraq, the summer is so hot, usually higher than 45 °C, and a special attention has to be paid to prevent extreme weather conditions and reducing the cooling load required for the building. Insulation slows the rate of heat transfer, helping keep homes warmer in winter and cooler in summer. The well-insulated home will satisfy comfortable conditions and consume less energy for heating and cooling. The aim of this study is evaluate the actual contribution of thermal insulation on the cooling load required for Iraqi building. For this purpose, an experimental study has been done to investigate the effect of thermal insulation on the building performance. The results show that average indoor temperature reaches 32 °C in May and 34 °C in June for sufficient insulation (insulation for all exposed walls and roof). The results also show that the annual saving in cooling energy could reach up to 65 kWh/m<sup>2</sup>, about (30%) compared to the conventional situation.

## Introduction

Typical insulation materials could be used including cellulose, mineral wool, polystyrene and polyurethane. Cellulose insulation is suitable for spaces filled completely, while, a high density rigid insulation is better suited under a floor slab. Department of Energy (DOE) has recommended R-values based on the regional climate and the demand for heating and cooling [1]. It is important to note that, the US R-value is given in unit of ft<sup>2</sup>·°F·hr/Btu and it is easy to confuse with SI R-value which is given in m<sup>2</sup>·K/W, thus US R-values are approximately six times SI R-values. However, in this study a new insulation material has been studied in order to evaluate the insulation impact on the buildings according to thermal, economic and environmental views.

## Previous Review

From 2004 to 2008; a series of studies have been done by a research team at the University of Technology in Baghdad [2] under a contract with the Ministry of Higher Education and Scientific Research (MHESR), in order to improve the thermal performance of the Iraqi buildings. The examination room included some environmental solutions such as thermal insulations. The design was analyzed using a computerized program Ecotect. The results showed that there is ability to reduce the electrical power by about 60% and offer inside room temperature less than 35 °C in summer. The design also showed decreasing by 40 % of the heating energy in winter by using of thermal insulations. Another study carried out by Kalif A. et al (2013) [3] tried to calculate the effect of packaging materials on the cooling load in Baghdad. The study conducted a survey of several materials like gypsum board, wood sheathing granite and ceramic layers. A computer programming was done to estimate the amount of cooling load through the walls by using CLTD (Cooling Load Temperature Differences) style method described by ASHRAE. The U-value of materials was determined depending on the resistance method. The results showed that the percentage reduction in cooling load when using internal packaging materials ranges between 5%-12%. A study carried out by Abdulsada G. and Wasmi T. [4] using a new local thermal insulation which is the reflective carbon sheets. Many parameters are taken into account like ambient