

**ENERGY PERFORMANCE OF DEMONSTRATED BUILDING WITH  
INSULATED ROOF AND CEILING IN TROPICAL CLIMATE**

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## ABSTRACT

It is a generally held view that, in tropical countries like Malaysia, insulated building is more sympathetic to the prevailing climate and provides comfortable interiors. This study analyses the benefits of roof pitch insulation and ceiling insulation in 24-hour cooling mode using field data. The Twin Energy Efficiency Test Cells with identical building design and constructions have been built in the main campus of University Technology MARA in Shah Alam, Selangor and named as Test Cell A and Test Cell B. The dimensions of both test cells are 4.0m x 4.0m x 4.5m and equipped with 950W split air conditioning system were used. The evaluation of thermal and energy performance were done by analyzing the indoor temperature, attic temperature, outdoor temperature and cooling load. In this research, all data were collected using automated data logging system for 5days roof pitch insulation and 10days ceiling insulation in 10 minute interval. Interestingly, it was found that by installing insulation material at the roof pitch, the performance better than installed above ceiling. For roof insulation showed energy saved per day was almost 0.42kWh or 2.52%.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of study

The recent energy crisis and the environment impacts of building industry have led to the active promotion of principles of sustainable development in recent times. So, minimization of energy usage is the key to improve sustainability where the actual impact is assessed on the basis of life cycle cost estimates (Halwatura et al., 2009). Nowadays, various models of houses were adapted from European styles considering only the beauty of the outside and neglecting the thermal comfort of the residents (Khedari et al., 1997). In tropical climates, buildings are overheated during the day due to solar heat gain through the building envelope and solar penetration through windows (Rajapaksha, 2003) and it will develop a condition of thermal discomfort. Therefore, the demands for comfort conditions in buildings are significantly increased as a result of exposure to uncomfortable outdoors (Ahmed, 2003). Perhaps, air conditioning will be the answer to this problem of uncomfortable conditions but the process of air conditioning requires energy which most of people in the developing countries have limited affordability (Zain *et al.*, 2007). However, by using insulation material for prevent prevailing heat from solar radiation penetrates into the building will reduce the energy consumption as suggested by Harimi et al., (2005), Al-Homoud, (2005) and Zakaria (2008). In this country, the installation of radiant barrier is a standard practice for roof in residential building but not the thermal insulation (Zakaria, 2008). This study evaluates whole-building thermal