



**INVESTIGATION OF THE EFFECTIVENESS OF A LIGHT PIPE IN
REDUCING TEMPERATURE INSIDE THE OCCUPIED SPACE IN
MALAYSIAN CLIMATE**

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A thesis submitted in partial fulfillment of the requirements for the award of
Bachelor Engineering (Hons) (Mechanical)

**Faculty of Mechanical Engineering
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APRIL 2005

ACKNOWLEDGEMENT

In the name of Allah S.W.T the most Merciful and the most Gracious, it is with the deepest sense of gratitude to Allah S.W.T who has given the strength and ability to complete this project.

I wish to express my sincere gratitude and appreciation to my supervisor, Prof. Dr Azni Ahmed for her full support, guidance and her time, to co-supervisor Mrs Salmah Ahmed for her help, advice and guidance towards the success of this project. And also to Assoc. Prof Dr Samirah Abdul Rahman for her involvement in this project.

Also I would like to thank, several people in the Faculty of Mechanical Engineering for their involvement in the project, together providing me the support and their time. The acknowledgement is also extended to all my friends for their encouragement me and also to my family who has always been there for me during my study years in UiTM.

Last but no least, thanks to all staff at Block-G UiTM for their kindness and understanding while I was conducting the experiment for this project. It will be a long lasting memory which will never be forgotten. May Allah bless all of you.

ABSTRACT

Increasing the use of natural daylight for lighting purposes in the buildings may offer savings in total building energy consumption. One technique of utilize the natural light is the use of light pipes that cannot only bring light into otherwise inaccessible or dimly lit places, but also improves the internal environment and visual comfort. This study aims to investigate the effectiveness of light pipe in reducing the temperature in an occupied space for Malaysian climate. The performance of light pipe was evaluated measuring the temperature and relative humidity for both indoor and outdoor simultaneously. The study was divided to four parts. In the first part, the experiment was conducted to measure the temperature and humidity inside the occupied space due to the transmitted daylight from light pipe alone. In the second part, the same measurements were carried out with the room was totally lighted by artificial light. Then the measurements were repeated for the measurement if temperature and humidity due to the daylight that enter through the openings (windows) and also the light pipe. In the final part, the room was lighted up only by daylight through openings. In all four cases, the air temperature and relative humidity for outdoor and indoor were measured simultaneously. Temperature differences and humidity differences between the outdoor and indoor were calculated and comparisons between cases were made. In general it was found that the day lighting transmitted via light pipe gives positive effect in reducing internal temperature and humidity inside the building. The results indicate that the day lighting from light pipe generates less heat compared to artificial lighting as could be observed from the higher indoor and outdoor temperature difference as measured in the first part of experiment. The internal relative humidity was also found to be relatively lower when the room was lighted by day lighting using light pipe compared to artificial light.

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CHAPTER I

INTRODUCTION

1.0 Research Background

Energy demand increases with population growth and escalating income. In Malaysia lighting and air-conditioning are the two major consumption of energy in Malaysia, with air-conditioning accounting for 50% - 60% and lighting 25% - 30% of the total energy consumption in commercial buildings. The increase in energy consumption will eventually lead to greenhouse a gas emission which has great impact impact on global climate change, environmental pollution, and as well as depleting energy resources. Before the invention of the electric bulb, natural light played a very important role in the lives of human being. Buildings were designed and built to take advantage of daylight to enable people to read, write, and to do all kinds of work. The use of natural lighting was then forgotten after the advent of the electric bulb. This phenomenon did not improve as electricity became available to many households, offices, and factories. The process of industrialisation, globalisation, modernisation and the increase of technology have led to the creation of new man-made materials and the reduction of natural materials such as timber. These new materials are then being used in the building industry together with new and innovative designs resulting in over-heated or energy-inefficient buildings which are less comfortable than they have ever been before. In cold temperature countries, energy is needed for lighting, refrigeration, heating, and so on. Likewise, energy is