UNIVERSITI TEKNOLOGI MARA

FSPU
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

FULL PAPER
PROCEEDING

3RD UNDERGRADUATE SEMINAR

BUILT ENVIRONMENT & TECHNOLOGY

SEPTEMBER
2018

ISBN 978-967-5741-67-8

FACULTY OF ARCHITECTURE, PLANNING & SURVEYING
UNIVERSITI TEKNOLOGI MARA PERAK BRANCH
SERI ISKANDAR CAMPUS

UiTM PERAK @ Seri Iskandar

QUANTITATIVE THERMAL COMFORT ANALYSIS OF TRADITIONAL PERAK MALAY HOUSES

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Abstract:
This research is conducted to determine the thermal comfort condition in traditional Malay houses in Perak. There is limited scientific study to prove that the traditional Malay house is comfortable despite the high outside temperatures, since most studies are done qualitatively. The traditional Malay houses are under threat of decay due to lack of maintenance and care. Most of their roofs have been replaced with other materials such as metal which cause uncomfortable internal condition. The measurement of air temperature, relative humidity and air velocity were taken inside two different types of traditional Perak Malay houses: the Kutai and the Perak house. Both of the houses studied are newly built and located in Meru, Ipoh. The measurements taken are compared with the comfort range standards specified by MS1525:2007. Bioclimatic chart shows the results taken fall outside the recommended comfort zone. The data showed that the high temperature inside both houses are found to be above the recommended comfort range. The measurements of air velocity and relative humidity are found to be within the recommended comfort ranges.

Keywords: Perak Traditional Malay houses; Roofing material; Thermal comfort; Kutai House; Perak House.

1.0 INTRODUCTION

"The traditional Malay house is one of the wealthiest segments of Malaysia's social legacy. It shows the inventive and stylish aptitudes of the Malays"(Nasir and Hashim, 2011). The house is extremely well designed to suit the warm and humid Malaysian climate. The traditional Malay house is said to be comfortable despite the high outside temperatures. There is limited scientific study to prove this. Most of the studies on traditional houses are done qualitatively. This case study focuses on traditional Malay houses (Kutai and Perak house) located at Meru, Ipoh. The objectives of this study are to measure the air temperature, relative humidity and air velocity inside two different types of traditional Perak Malay houses: the Kutai & Perak house. Other than that, it also compares thermal properties of current and original roof materials used in these houses.

2.0 LITERATURE REVIEW

Thermal comfort is something that can be measured by taking some data of the environment of the house. In this study, the Traditional Malay House is reviewed based on the characteristics that may influence the data of thermal comfort. The data collected was then reviewed based on the thermal comfort standard.

2.1 Traditional Perak Malay house

Traditional house are designed with a deep understanding and respect for nature. They are designed to adapt to the climate and environmental condition that the house is set in. They use lightweight construction of wood and other natural materials. Traditional houses use a few types of good ventilation ; the roof space in the house are properly ventilated by the provision of ventilation joints and panels in the roof construction and elongated open plans of this house allow easy passage of air and good cross ventilation. The use of large overhangs and the low exposed vertical areas of the windows and wall in the

house provide good protection against driving rain, provide good shading, and allow the windows to be left open most of the time for ventilation (Yuan, 1987).

Table 1: Comparison of Original and Current Traditional House

Characteristic	Kutai House		Perak House	
	Original	Current	Original	Current
Roof Material	Nipah	Onduline	Nipah	Onduline
Wall Used	Bamboo weave /timber	Timber	Timber	Timber

2.2 Thermal Comfort

Thermal comfort is perceived as the comfort of human beings under given room conditions (Mcmullan, 2012). Due to individual differences of the perception or sensation of humans, a universally valid thermal room climate in which amenity for all is realized, is not producible (Yau, 2011). Thermal comfort standard in accordance to MS:1525:2007) are, i) Air Temperature: 23℃ to 26℃, ii) Relative Humidity: 55 % to 70 %, and iii) Air Velocity: 0.15 m/s to 0.5 m/s

3.0 METHODOLOGY

The methodology for this study is summarized as per Figure 1**.**

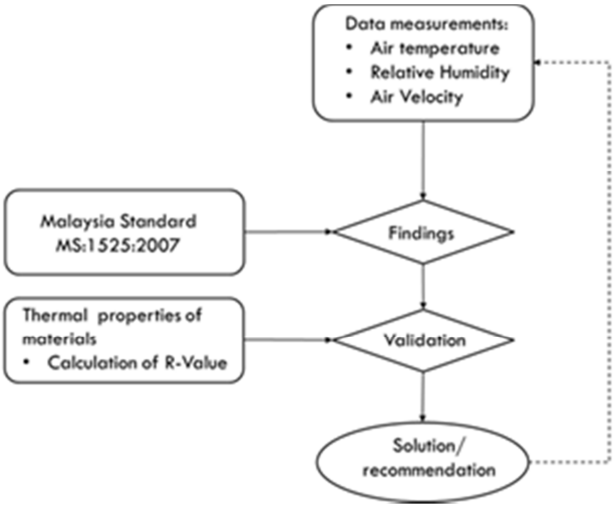

Figure 1: Summary of Research Methodology

4.0 ANALYSIS AND FINDINGS

Figure 2 shows the temperature data against humidity. From the bioclimatic chart, we can see that there are similar patterns in both houses. The data for the houses fall outside the recommended comfort zone. Both houses do not achieve thermal comfort due to high temperature. Table 2 shows that the R-value of Nipah roof is higher than onduline and metal roofs. High R-value reduces heat gain into the building

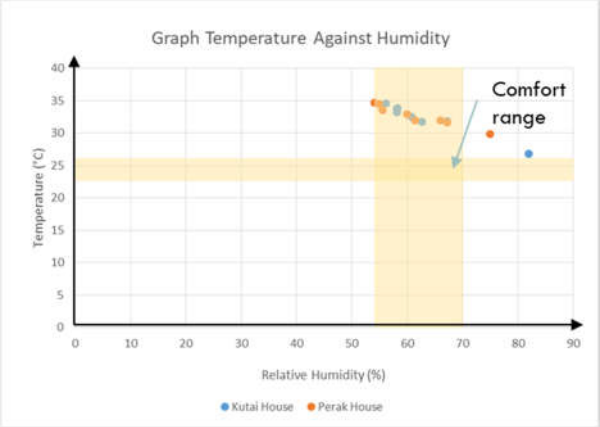

Figure 2 Temperature against humidity.

Table 2 comparison R-value of different roof materials:

No	Material	K-value(W/mK)	Thickness(m)	R-value(m²K/W)
1	Nipah	0.03	0.05	1.7
2	Onduline	0.066	0.003	0.045
3	Metal	0.4	0.004	0.01
4	Insulation (eg:thermal rock)	0.036	0.05	1.39

5.0 CONCLUSION

Both houses do not achieve thermal comfort recommended by MS:1525:2007 due to high internal air temperatures. The traditional Malay houses have many openings which resulted in high air velocity and lower relative humidity. Nipah has high R-value (resistance to heat) to prevent heat gain than metal and onduline. Insulation is recommended if metal or onduline is used for roofing.

REFERENCES

Malaysian standard 1525: 2007. Code of practice on energy efficiency and use of renewable energy for non-residential buildings (1st revision).

Yuan, L. (1987). The Malay House. Pulau Pinang, Institut Masyarakat.

McMullan, R. (2012). Environmental Science in Building. London, Palgrave Macmıllan.

Nasir, A. H. & Hashim, W. (2011). The Traditional Malay House. Kuala Lumpur, Institut Terjemahan Negara Malaysia Bhd.

Yau, Y. H., (2011). Thermal comfort and Indoor Air Quality at Green Building in Malaysia.