UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INVESTIGATION ON THE EFFECTIVENESS BETWEEN A RESIDENTIAL MODERN ROOF DESIGN AND TRADITIONAL 'MALAY-STYLE KAMPUNG' ROOF DESIGN IN MALAYSIA TO ACCOMMODATE RAINWATER DRAINAGE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours.

by

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I hereby, declared this report entitled INVESTIGATION ON THE EFFECTIVENESS BETWEEN A RESIDENTIAL MODERN ROOF DESIGN AND TRADITIONAL 'MALAY-STYLE KAMPUNG' ROOF DESIGN IN MALAYSIA TO ACCOMMODATE RAINWATER DRAINAGE is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : MR. KHAIRIL AMRI BIN KAMARUZZAMAN

ABSTRAK

Malaysia menerima hujan lebat sepanjang tahun, kira-kira 2030 mm. Taburan hujan di Malaysia tidak sekata dari sebulan ke sebulan dan dari satu tempat ke tempat yang lain kerana faktor-faktor seperti tiupan angin, litupan awan dan bentuk muka bumi. Penduduk Malaysia perlukan tempat untuk berlindung dari kesan panas matahari dan hujan yang lebat iaitu dengan adanya sebuah rumah. Oleh itu, dalam struktur sebuah rumah, bumbung memainkan peranan penting akan tetapi rumah yang dibina masa kini telah mengikut arus pemodenan hingga mengabaikan kepentingan bumbung untuk menampung pengaliran air hujan seperti pemilihan jenis bahan dan sudut bumbung rumah. Pada waktu yang sama, penambahan beban yang tinggi kepada bumbung, kelembapan kepada bahan binaam dan pertumbuhan kulat dan pereputan, sekaligus ia mengakibatkan kerosakan. Dalam kajian ini, objektifnya adalah untuk membandingkan antara beberapa jenis bumbung moden dan tradisional dan untuk menguji dari segi keberkesanan bumbung mengalirkan air hujan. Empat perbezaan jenis dan sudut bumbung akan diuji dengan struktur model. Selepas itu, keputusan akan direkodkan dan dibandingkan untuk menganalisis. Hasil yang dijangka adalah dapat mengesyorkan pemilihan sudut yang sesuai terhadap jenis bumbung.

ABSTRACT

Malaysia receive heavy rain throughout the year, around 2030 mm of rain. The distribution of rainfall in Malaysia is irregular from month to month and from one place to another due to affecting factors such as the wind blow, clouds coverage and geographical factor. It is necessary for the Malaysians to own a house in order to protect them from the heat of the sun and heavy rain. Thus, for the structure of the house, roof plays a vital role, however, newly built houses nowadays had undergone modernization to which they neglected the importance of the roof itself where it should be able to sustain the rainwater flow by choosing the roof material and angle of the roof. At the same time, the additional large burden put onto the roof, the humidity of the building materials and fungal growth and decay, would eventually cause damage. In this research. The objective is to compare between a few types of modern and traditional roofs and to observe the effectiveness of these types of roof to flow rainwater. Four different types and roof angle was tested using the model structure. Later, the result are recorded and compared for the purpose of analyzation. The expected result would show the recommendation of suitable angle for each type of the roof.

DEDICATION

I would like to express my sincere gratitude to the Universiti Teknikal Malaysia Melaka (UTeM) for letting me fulfil my dream of being a student here. I would also like to thank the Faculty of Mechanical and Manufacturing Engineering Technology for giving me the opportunity to write an honours thesis.

The thesis becomes a reality with the kind support and help of many individuals. I would to extend my sincere thanks to all of them. In the hopes this work may in some way contribute to their research of roof construction application.

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Respect, love and thanks to my family members – my father, my mother who gave so much moral support throughout this process. Not forgotten for my siblings and love who encourage me a lot. Thanks so much for your understanding and support.

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I would like to also thank all my friends who help me by discussing this project. All gratitude for all people who get involved with this project. I do wish this research would be benefical for future reference. Thank you.

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°N	-	North
°E	-	East
°	-	Degree of angle
’	-	Foot
’’	-	Inch
m	-	Meter
mm	-	Millimeter
˚C	-	Degree Celsius
Q	-	Volumetric flow-rate
%	-	Percent
m²	-	Square Meter
L	-	Liters
s	-	Second
V	-	Volume
kg	-	Kilogram

LIST OF ABBREVIATIONS

MetMalaysia	Jabatan Meteorologi Malaysia
UTeM	Universiti Teknikal Malaysia Melaka
WHO	World Health Organization
KALAM	Pusat Kajian Alam Bina Dunia Melayu
UTM	Universiti Teknologi Malaysia
IRC	International Residential Code
AS/NZS	Australian/New Zealand Standard
ARI	Average Recurrence Interval
MIG	Metal Inert Gas
BS	British Standard
UPM	Universiti Putra Malaysia
UV	Ultraviolet

CHAPTER 1

INTRODUCTION

1.1 Project Overview

Malaysia is a country that is filled with wonderful arts in house architecture during the old times. Every house architectural was built with the compatibility accordingly Malaysia weather and it has brought tremendous comfort to the residents. Nowadays, during the era of globalization, the elements of art available in traditional houses are frantically fading due to the new trends of modern architectural house structure. In addition, Malaysia's economy where it had caused the increment of the cost of construction for the materials such as wood and steel. The issues that had been raised are, house construction in Malaysia had switched to the cost saving production to the point that they no longer prioritize the elements that were necessary for every house designation to ensure the residents' comfort.

Roof is an essential element and it needs to be emphasized on when constructing a house. It does not only beautify the design of the house but also protect the house from heat and rainfall. Thus, in this study, the comparison of the type of the roof is conducted between modern roof which is often used in house construction nowadays and traditional roof which is used by the Malay society during the old days. The comparison is to collect data on which type roofs are more effective on term of rain drainage.

However, the issues with the modern house architecture could be assured when most of the house buyers tend to renovate or reconstruct their house roof due to the flow of air and

rain impact. According to L. ida (2017), “Dr. Uniey also stressed, for every purchase of the house, the main thing that should be paid attention upon is the roof because the roof is the first element that receive the impact of the rain and heat. Roof also functions as the protector during hot weather and it is capable of draining the water of the building quickly when it is raining”.

1.2 Problem Statement

Jabatan Meteorologi Malaysia (MetMalaysia) stated that Malaysia is located near the equatorial line between the 1°N - 7°N and the 98°E - 119°E vertical line, a tropical country with a humid and hot climate throughout the year. In closing the houses, the structure of the roof is an important part in the construction of the residential house architecture since it would help to ensure better flow of the rain water that would cause a few problems such as adding extra high load to the roof, impact of humidity on roofing material, fungal growth and decay and dengue.

The house structure was made of materials (wood, bamboo, galvanized and others) that carries own load so that mean the structure will be influenced by its own load to hold. So, when the extra load such as occurrence rainwater ponding weight keep increasing to the point of roof it could no longer resist the load, it would have caused damage to the structure of house roof.

Impact of humidity on roofing material causes for the defect such as the decaying of wooden materials and rusty steel materials. The humid condition would accelerate the