



# CULTURAL HERITAGE

The Foundation For Sustaining And Empowering Of Communal Identity

## E-PROCEEDINGS OF EXTENDED ABSTRACTS THE 1<sup>ST</sup> INTERNATIONAL SYMPOSIUM ON CULTURAL HERITAGE (ISyCH) 2021

Chief Editor

Dr. Ainul Wahida Radzuan

Editors

Dr. Nordiana Ab Jabar, Dr. Suraya Sukri, Dr. Raja Iskandar Raja Halid, Sudirman Kiffli, Siti Nur Anis Muhammad Apandi, Farrah Atikah Saari

Organised by

Department of Heritage Studies,  
Faculty of Creative Technology and Heritage,  
Universiti Malaysia Kelantan

Email: [jpwsych@gmail.com](mailto:jpwsych@gmail.com)

Facebook: <https://www.facebook.com/ISyCH2021>



PUSAT PENGAJIAN  
BAHASA, TAMADUN DAN FALSAFAH  
SCHOOL OF LANGUAGES, CIVILIZATION & PHILOSOPHY  
Universiti Utara Malaysia



UNIVERSITI  
PENDIDIKAN  
SULTAN IDRIS  
اينورسين لىديين سولتان ايدريس  
SULTAN IDRIS EDUCATION UNIVERSITY

Copyright ©2021

Exclusive rights by Faculty of Creative Technology and Heritage, Universiti Malaysia Kelantan, Bachok, Kelantan.

All rights reserved. No part of this book may be scanned, uploaded, reproduced, distributed, or transmitted in any form by any means whether electronically, photocopying, mechanics, recording or others before obtaining written permission from the author or publisher.

E-PROCEEDINGS OF EXTENDED ABSTRACTS  
THE 1<sup>ST</sup> INTERNATIONAL SYMPOSIUM  
ON CULTURAL HERITAGE (ISyCH) 2021

e-ISBN Number: 978-967-2912-92-7

Published by  
Faculty of Creative Technology and Heritage  
Universiti Malaysia Kelantan  
16300 Bachok  
Kelantan  
Malaysia



## A REVIEW ON MALAY VERNACULAR ARCHITECTURE VENTILATION DESIGN ELEMENTS EFFECTIVENESS AND ITS APPLICATION

K Rizal<sup>1</sup>, I Ismi<sup>2</sup>, A Azli<sup>3</sup>, M Azri<sup>4</sup>, M Aisyah<sup>5</sup>

School of Architecture and Ekistics, Universiti Malaysia Kelantan, Kampus Kota  
Pengkalan Chepa, 16100 Kota Bharu. Kelantan. <sup>12345</sup>

izal.k@umk.edu.my<sup>1</sup>, hamadi.i@umk.edu.my<sup>2</sup>, azli.ab@umk.edu.my<sup>3</sup>,  
azri.mjn@umk.edu.my<sup>4</sup>, aisyah@umk.edu.my<sup>5</sup>

### ABSTRACT

Thermal comfort and ventilation needs of the occupants have been achieved successfully with the perfect solution by means of Malay vernacular architecture design. Ventilation have always been a major design element that needs to be thoroughly planned especially in Malay vernacular architecture in order to provide thermal comfort to the occupants. Amongst the various factors that affects ventilation in Malay vernacular architecture are the availability of multiple windows and openings, the orientation of the building, roof design as well as a variety of floors that contributes to further enhance the thermal comfort of the occupants. Thus, modern development needs to incorporate the suitable elements and applications for ventilation based on the design solutions provided by the Malay vernacular architecture into their designs. A study on vernacular ventilation assists in reinstating the relevance of its application in providing the most efficient thermal comfort to the occupants. The main focus of this research paper is to identify the applications and optimization of ventilation in Malay vernacular architecture by means of conducting simulations and reviewing case studies as it could further assists designers in the future to provide modern developments that are more feasible in its design specifically on its thermal comfort. This research will provide adequate case studies and ethnographic observations to further enhance the understanding of Malay vernacular architecture ventilation elements in which the researcher would behave as a participant in this progressive study. This research is conducted to change future architects and designers approach in planning and designing more feasible ventilated contemporary buildings.

**Keywords:** application; feasible; Malay vernacular architecture; ventilation

### 1. INTRODUCTION

This paper aims to identify the interdependence relationship between the Malay vernacular and contemporary architecture ventilation design elements and its application to our natural climate. This identification process further strengthens the understanding of designers on how Malay carpenters were able to build and design vernacular architecture that accommodates and facilitates Malaysia's equatorial climate. In accordance with Hutchinson, (2002), 'the characterization of a house depicts a clear projection of a specified region' [1]. Critical factors of house designs are being reflected such as materials, climate, cultural background as well as economics [3]. Hence, reflection of occupant social background in the region, local materials usage, climatic factors consideration as well as thermal comfort requirements in a design of a house is the very definition of Malay vernacular architecture. This could be supported by a study done by Krisprantono (2005), in which he stated that the relationship between the practical knowledge and the theoretical notion that indulges the

physical and non-physical traits of a specific place or location is being pursued in vernacular architecture [2]. Thus, material limitation, topography and climate variations are amongst understanding which is linked with our human nature in terms of environmental adequate responses which are constantly being referred to as the physical character. While, social relationship, technology and traditions as well as history are referred to as the non-physical character. The relationship between society, mankind and the ecological environment symbolizes synergies in which the natural traditions are being expressed and emphasized by Krisprantono[2].

## 2. MATERIALS AND METHODS

The selected design simulation software for this research is the INSIGHT plugin from Revit Autodesk as it is deemed suitable and adequate in acquiring the objectives of the study, which is to formulate the settings to simulate relative humidity, rate of air flow and the temperature of the air. As of the natural ventilation, the software of MacroFlo is coordinated into the INSIGHT simulation, which is applied further to simulate the flow of air driven by pressure of the wind and forces of buoyancy through components of doors and window openings. The MacroFlo application is also integrated within Apache, which could also be used to simulate relative humidity together with temperature of the indoor air based on the setup weather design database. The table below shows the materials of the buildings being assigned to both of the Rumah Selangorku and both Malay vernacular house in INSIGHT software. The proper material for the building is vital to attain precise simulation readings. However, certain materials were not available for the design database setup such as regional materials which includes a gap timber floor, a bamboo thatched wall as well as an 'attap' roof usually made from palm leaves. Hence, the materials resemble the most to it were chosen for the simulation.

**Table 1.** Simulation of materials and their U-Values

Elements of Construction	Vernacular Malay House	The U – Value (W/m <sup>2</sup> k)	Rumah Selangorku	U – Value (W/m <sup>2</sup> k)
Roofing	Slope Roofing –			
Domestic	3.3770	Flat Roof Design	0.2500	
Ceiling	Joist - Timber			
Interior Ceiling	1.2580	100mm Reinforced – Concrete Ceiling	3.6840	
Exterior Wall	Timber Wall Framing	0.4490	Brick / Block Wall	0.4395
Interior Partition	Frame Partition With 1 In. Wood	1.1630	115mm Single – Leaf Brick	1.9710
Ground Floor	Un-Insulated Suspended Timber Floor	0.6280	Slab on grade Floor	0.1980
Door	Wooden Door	2.1945	Timber Flush – Panel Hollow – Core Door	2.3255



### 3. RESULTS AND DISCUSSION

The location and sizes of the openings are the major factors that allows air intake to flow in the building effectively. As per the tabulated data, the Malay vernacular house is able to register higher percentage reading of openings compared to the Rumah Selangorku building.

**Table 2.** Temperature of indoor air of case study

Thermal Variable	Statistics	Case 1: House of Tan Mas Mohar		Case 3: Rumah Selangorku (1 <sup>st</sup> Floor)		Case 4: Rumah Selangorku (11 <sup>th</sup> Floor)	
		Rumah Ibu	Serambi	Liv/ Din	Kit	Liv/ Din	Kit
Air Temperature	Space						
	Mean	25.1	25.1	26.8	25.4	26.8	25.4
	Max	29.5	30.5	29.0	28.6	29.5	29.0
	Min	23.4	23.3	24.2	23.7	24.1	23.6

**Table 3.** Approximate humidity of case study

Thermal Variable	Statistics	Case 1: House of Tan Mas Mohar		Case 3: Rumah Selangorku (1 <sup>st</sup> Floor)		Case 4: Rumah Selangorku (11 <sup>th</sup> Floor)	
		Rumah Ibu	Serambi	Liv/ Din	Kit	Liv/ Din	Kit
Relative Humidity (%)	Space						
	Mean	80.1	80.3	74.5	78.4	75.0	78.6
	Max	97.5	99.8	92.7	93.6	92.7	93.5
	Min	59.6	55.4	54.0	59.7	53.5	58.2

**Table 5.** External and Internal Ventilation of case study

Thermal Variable	Statistics	Case 1: House of Tan Mas Mohar		Case 3: Rumah Selangorku (1 <sup>st</sup> Floor)		Case 4: Rumah Selangorku (11 <sup>th</sup> Floor)	
		Rumah Ibu	Serambi	Liv/ Din	Kit	Liv/ Din	Kit
Macroflo Internal Vent. (l/s)	Space						
	Mean	110.9	64.1	132.5	112.0	142.8	110.6
	Max	960.5	1091.0	323.6	293.3	413.4	344.2
	Min	0.0	0.0	13.9	0.4	15.5	0.0

Thermal Variable	Statistics	Case 1: House of Tan Mas Mohar		Case 3: Rumah Selangorku (1 <sup>st</sup> Floor)		Case 4: Rumah Selangorku (11 <sup>th</sup> Floor)	
		Rumah Ibu	Seram-bi	Liv/Din	Kit	Liv/Din	Kit
Macroflo External Vent. (l/s)	Space						
	Mean	389.4	404.7	18.4	11.1	31.8	18.5
	Max	3288.2	3638.4	189.8	145.6	335.5	256.7
	Min	0.2	0.2	0.0	0.0	0.0	0.0

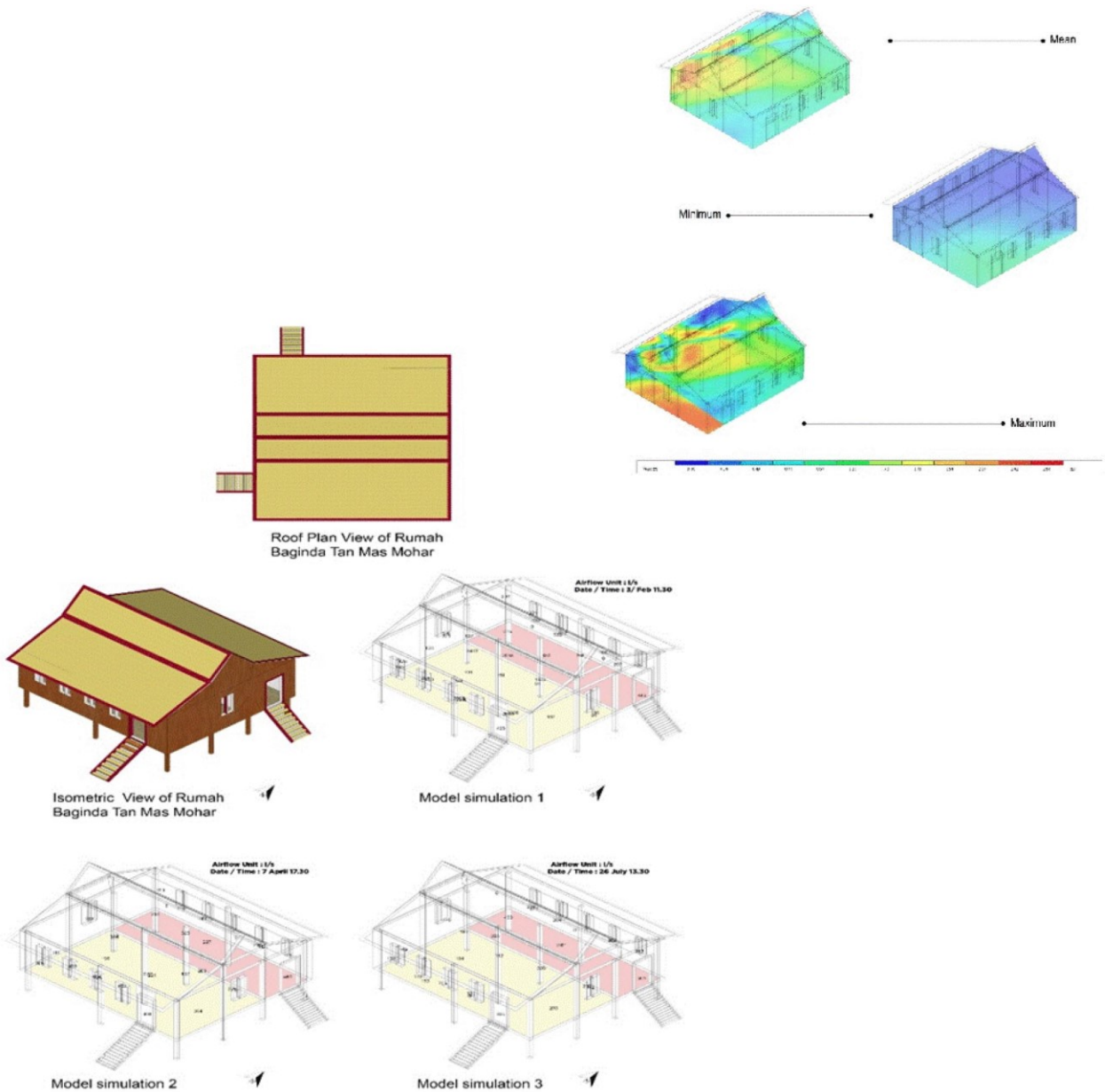


Figure 1. Heat and ventilation simulations of Rumah Baginda Tan Mas Mohar

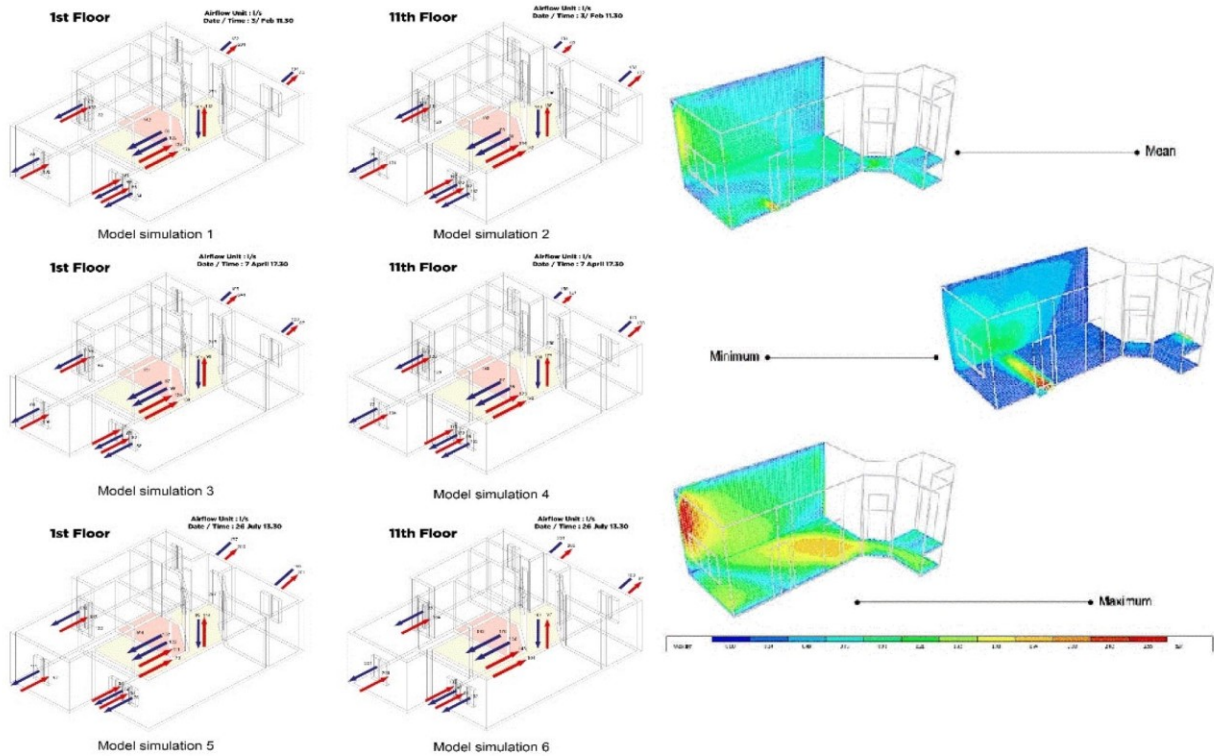


Figure 2. Heat and ventilation simulations of Rumah Selangorku 1<sup>st</sup> and 11<sup>th</sup> floor

#### 4. CONCLUSION

In a nutshell, in the design of Malay vernacular and social projects developments there were several issues being discovered. As can be gathered from this study, the social projects uses materials such as bricks and concretes that have high capacity of thermal as compared to the Malay vernacular house which uses materials that readily gives out heat and helps cools the building. These materials used in the social projects can causes discomfort during night time as it has high heat capacity and usually stores a high amount of heat.

#### ACKNOWLEDGEMENT

The authors acknowledge Faculty of Architecture and Ekistics, University Malaysia Kelantan for the research facilities. Special thanks to those who contributed to this project directly or indirectly.



## REFERENCES

1. A. Foruzanmehr and M. Vellinga, "Vernacular architecture: Questions of comfort and practicability," *Build. Res. Inf.*, 2011, doi: 10.1080/09613218.2011.562368.
2. Krisprantono Krisprantono, "THE INTEGRATION OF VERNACULAR VALUES INTO THE EDUCATIONAL FRAMEWORK OF CONTEMPORARY DESIGN," *Dimens. (Jurnal Tek Arsi tektur)*, 2003.
3. P. Oliver, *Built to Meet Needs: Cultural Issues in Vernacular Architecture*. 2007.
4. M. Z. O. Faridah Shafii, Z. A. A., "Achieving Sustainable Construction in Developing Countries of Southeast Asia. Paper presented at the The 6th Asia," *Pacific Struct. Eng. Constr. Conf. 2006*), 2006.
5. M. Meteorological Department, "General Climate of Malaysia," *Ministry of Science, Technology and Innovation*, 2016.
6. L. J. Yuan, "The traditional Malay house," *Indig. Tradit. Knowl. Pract.*, 2002.
7. "Environment Encyclopedia and Directory," *Int. J. Sustain. High. Educ.*, 2002, doi: 10.1108/ijshe.2002.24903bae.006.
8. M. S. A. Rashid and S. C. Amat, "The Traditional Malay Architecture : between aesthetic and symbolism," *Semin. Intellect. Prop. Herit. Issues Built Environ.*, 2008.
9. H. N. H. Tajrul Edrus Nordin, "CLIMATIC DESIGN FEATURE IN THE TRADITIONAL MALAY HOUSE FOR VENTILATION PURPOSE," *University Technology MARA*, 2009.
10. S. H. Ibrahim, A. A. H. Liew, M. N. M. Nawi, and M. N. Yusoff, "Reinventing traditional malay house for sustainable housing design: Obstacle and proposed solution," *J. Teknol.*, 2015, doi: 10.11113/jt.v72.3134.
11. K.S.Kamal, L. Ab Wahab, and A. Che Ahmad, "Adaptation Design of Traditional Malay House to Meet the Requirements of Comfort Living in Modern Houses," *MALAYSIAN Surv.*, 2004.
12. Z. Ismail and A. S. Ahmad, "Modularity Concept in Traditional Malay House (TMH) in Malaysia," *Int. Conf. Constr. Ind.*, 2006.
13. K.S.Kamal, L. Ab Wahab, and A. Che Ahmad, "Climatic design of the traditional Malay house to meet the requirements of modern living," *Malaysian Surv.*, 2004.
14. M. F. Mohd Sahabuddin and C. Gonzalez-Longo, "Traditional values and their adaptation in social housing design: Towards a new typology and establishment of 'Air House' standard in Malaysia," *Archnet-IJAR*, 2015, doi: 10.26687/archnet-ijar.v9i2.493.
15. Wan Burhanuddin, "The Malay House: Learning from its Elements, Rules and Changes," *Journal of Design Policy: Design and Society*, 1985