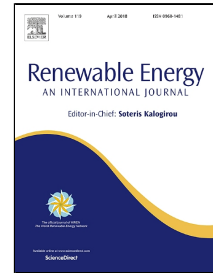


Accepted Manuscript

Passive Thermal Performance Prediction and Multi-objective Optimization of Naturally-ventilated Underground Shelter in Malaysia

A. Mukhtar, K.C. Ng, M.Z. Yusoff



PII: S0960-1481(18)30165-4
DOI: 10.1016/j.renene.2018.02.022
Reference: RENE 9753
To appear in: *Renewable Energy*
Received Date: 08 November 2017
Revised Date: 17 January 2018
Accepted Date: 03 February 2018

Please cite this article as: A. Mukhtar, K.C. Ng, M.Z. Yusoff, Passive Thermal Performance Prediction and Multi-objective Optimization of Naturally-ventilated Underground Shelter in Malaysia, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.02.022

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **Passive Thermal Performance Prediction and Multi-objective Optimization of Naturally-ventilated**
2 **Underground Shelter in Malaysia**

3 A. Mukhtar¹, K.C.Ng^{*2}, M.Z. Yusoff¹

4
5 ¹Centre for Fluid Dynamics, College of Engineering, Universiti Tenaga Nasional (UNITEN),
6 Putrajaya Campus, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor Darul Ehsan, Malaysia.

7
8 ²School of Engineering, Taylor's University, Taylor's Lakeside Campus, No. 1, Jalan Taylor's, 47500 Subang Jaya,
9 Selangor Darul Ehsan, Malaysia.

10
11 * Corresponding author. Tel: +60162838322
12 Email address: ngkhaiching2000@yahoo.com

13 **Abstract**

14 The impact of global warming has urged a prudent spending of energy in the building sector
15 nowadays. In general, a typical HVAC system consumes about 60%-70% of the total energy
16 consumption of a building. Therefore, designing an energy-efficient HVAC system is essential to
17 alleviate the worsening greenhouse effect. Recent research works have reported that geothermal
18 energy coupled with optimal insulation is the best approach in minimising the energy consumption.
19 Thus, we attempted to analyse the thermal performance of a naturally-ventilated underground
20 shelter in a hot and humid country such as Malaysia. We proposed an optimal design to enhance
21 the sustainability of the low-energy building. The model was numerically simulated using CFD,
22 and a statistical surrogate model was implemented for obtaining the optimal design. The findings
23 indicated that the room temperature of the shelter was significantly lower than the outdoor
24 temperature during the hottest month and vice-versa during the coldest month. Moreover, the
25 proposed optimal design showed about 3.4% increase in ventilation rate and about 2.8% decrease
26 in room temperature as compared to the previous design. In general, the current work could be
27 used as a guideline for designing low-energy building in Malaysia.

Download English Version:

<https://daneshyari.com/en/article/6764553>

Download Persian Version:

<https://daneshyari.com/article/6764553>

[Daneshyari.com](https://daneshyari.com)