

INVESTIGATION OF EARTH TUBE SYSTEM APPLICATION IN LOW INCOME BUILDING IN KUCHING, SARAWAK

MUHAMMAD SYUKRI IMRAN*, AZHAILI BAHARUN,
SITI HALIPAH IBRAHIM, WAN AZLAN WAN ZAINAL ABIDIN

Engineering Faculty, University Malaysia Sarawak,
94300 Kota Samarahan, Sarawak, Malaysia

*Corresponding Author: md.syukri@moh.gov.my

Abstract

Modern residential building in Malaysia particularly in Sarawak rarely consider the ground as a source of heat sink to cool down the building. This is probably due to the lack of information on surveyed ground temperature and energy modelling of such building. A typical low income residential building in Sarawak with earth tube was modelled in Energy Plus to determine the effect of earth tube to passively cool the building in Sarawak. From the simulation result, the indoor air temperature of the east facing zone of the building could be lowered from 33°C to 29.5°C. A further drop of about 0.6°C could be achieved if the room volume served by the earth tube is reduced. The PMV of the building were greatly reduced from 3 to 1.5 on a thermal sensation scale. The operative temperature is within 80% acceptability limits of 30.3°C operative temperature as per ASHRAE Standard 55 for naturally conditioned spaces.

Keywords: Passive cooling, Earth tube heat exchanger, Low income home, Thermal comfort, Energy simulation,

1. Introduction

Residential house in Sarawak generally are constructed above ground with no basement structure with the exemption of high rise shopping complexes. Building developers nowadays construct residential homes with little regards to indoor thermal comfort and make assumption that the future owner of building will install a mechanical means of cooling the indoor environment. This is true for low income houses in the state of Sarawak where one can find single storey low cost terrace house and low rise low cost flat are the common type of low cost house