

**FIELD STUDY OF PERFORMANCE OF LAB-SCALE BIO CLIMATIC HOUSE**

Piyachart Thateenaranon^{1*}, Jongjit Hirunlabh², Mana Amornkitbamrung³
Krichkanok Sudasna⁴, Joseph Khedari⁵ and Sompob Punyasompuk⁶

¹Division of Energy Technology, School of Energy, Environment and Materials
King Mongkut's University of Technology Thonburi
126 Pracha Uthit Road, Bang Mod, Thung khru, Bangkok 10140, Thailand

²Faculty of Engineering, Bangkokthonburi University
Thawiwatthana Road, Thawiwatthana, Bangkok 10170, Thailand

³Division of Thermal Technology, School of Energy Environment and Materials
King Mongkut's University of Technology Thonburi
126 Pracha Uthit Road, Bang Mod, Thung khru, Bangkok 10140, Thailand

⁴Faculty of Architecture and Design, Rajamangala University of Technology Rattanakosin
96 moo 3 Puthamonthon Sai 5, Salaya, Puthamothon, Nakhon Pathom 73170, Thailand

⁵Faculty of Architecture, Kasetsart University
50 Ngamwongwan Road, Jatujak, Bangkok 10900, Thailand

⁶Mechanical Technology Education, Faculty of Industrial Education and Technology
King Mongkut's University of Technology Thonburi
126 Pracha Utit Road, Bang Mod, Thung khru, Bangkok 10140 Thailand

* Corresponding Author: peeya.kob@hotmail.com

ABSTRACT

This paper aims to present the field study of performance of Lab-scale bio-climatic house. The bio-climatic house volume of 25 m³ was designed for maximizing natural ventilation, heat gain reduction, and daylighting. As a bio-climatic house, a solar chimney (SC) was attached to a Roof Solar Collector (RSC) that consisted of CPAC Monier tiles with a funnel 14 cm width and gypsum boards. The design of the partial roof was transparent to allow light pass into the house by the reflection of light. However heat could not enter the house. The walls were Modified Trombe Wall (MTW) which was made of plywood while and had ventilation channel of 14 cm. width that turned to the south. The results of filed measurements lead to understand the behaviour of air flow and circulation inside the bio-climate house and to ensure that the bio-climate house design and construction can approach to comfort zone for resident

INTRODUCTION

Nowadays a design of buildings is currently being converted into western style buildings. A traditional Thai style house in the past with a high platform, gable roof and open-wide hinged windows is almost modified to a European style houses. Accordingly the European style houses have a closed system hence ventilation in the houses has poor circulation and heat transfers from inside to outside badly as well. The

European style houses are suitable for using with an air conditioner and use more electricity. In contrast to ventilation of the Thai style houses is better than the European style houses because of the high platform that has ability to circulate air through it. Besides there are many open-wide hinged windows allow sunlight and wind blows though the houses, so it makes residents feel comfortable. For this reason, The Building Scientific Research Center (BSRC) has acknowledged the importance in the design of houses with air circulation and a natural light altogether. A solar chimney is installed in the houses [4-1] so that it can save energy by reducing the use of air conditioners and electricity. The residents then sense comfortable. Because of this, Bio Climatic House is mentioned and has applications of Roof Solar Collector (RSC)[5], the Modified Trombe Wall (MTW)[6], and Bio-Climatic Roof (BCR)[7]. These comfy houses have a design based on Thailand tropical climates. The Roof Solar Collector (RSC) is designed for high air temperature floating out via the roof as similarly as Modified Trombe Wall (MTW). At the same time the external air will flow into the air inlet instead from the bottom of the door that always creates air circulation in the house. Additionally Bio-Climatic Roof is planned a natural light into the house through light reflectivity, so it prevents thermal from the roof not transfer to inside. It is able to reduce energy and use of electric light bulbs. Moreover it will help night radiation cooling [8]. The Bio