ENERGY CONSUMPTION ASSESSMENT ON INDUSTRIALISED BUILDING SYSTEM (IBS)

Nadia Zaini, Siti Halipah Ibrahim, Nur Fadilah Darmansah, Abdul Wafi Razali, Sitti Diana Tamjehi, Afzan Ahmad Zaini, Hasmida Hamza and Sharifah NurFarhana Syed Sahimi
Department of Quantity Surveying, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), Kota Samarahan, Sarawak, Malaysia.

Abstract
Malaysia Government mission towards development of low carbon cities in reducing carbon emission by 40% by year 2020. Therefore, our construction industry plays an important role and gives negative impacts on the environment. Factors of embodied energy and carbon emission are important in selecting construction method by considering the low carbon type of construction material to be used during the construction process. This paper presents an analysis of Embodied Energy and carbon emission in a building that used IBS and conventional method to achieve sustainable construction in Malaysia. All data was recorded and analyse using a commercial Life Cycle Assessment (LCA) tool called Carbon Calculator. The study includes IBS component; precast concrete wall panel, column, beam and half slab and cast in situ components; burn clay bricks, reinforced concrete slab, column, and beam. The results are presented in terms of carbon dioxide equivalent (CO_2E) of construction materials and comparison analysis is made between IBS and Conventional method. The results obtained from Carbon Calculator due to manufacture and installation of components show a that IBS method consumed 26.93 CO_2E/m^2 and conventional method offers 39.57 CO_2E/m^2. By comparing IBS and conventional method, it is found that the average of total energy consumption due to construction materials was 33.25 CO_2E/m^2 and involved 31.94% reduction in comparison with conventional method. Therefore, for further building construction's practice in relation to type of construction method it is recommended to be below the average amount of energy consumption 33.25 CO_2E/m^2 (50%) and any values obtained above the average amount is considered not being able to adopt sustainable building practice. Generally, it can be concluded that implementation of IBS method can be regard as a potential in reducing the amount of embodied energy and carbon emission compared to conventional method.

Keywords: *Embodied energy; carbon emission; Industrialised Building System; conventional method.*

INTRODUCTION

In 21st century, one of the primary roles of construction industry is to generate wealth to the country. However, construction industry is not just concerned about financial return, but also on the long-term impacts of living standards for both present and future (Ding & Shen, 2010). Nowadays, strategies in achieving sustainable building have become a global focus in the world. Thus, the reduction of carbon emissions has become a primary focus of environmental strategies around the world (Farrar & Ceng, 2017). While in Malaysia, carbon emission has to be reduced up by 40% by the year of 2020. Currently, Malaysia is ranked 30th in the world for countries that experience the highest quantity of carbon emission (Rashid & Ismail, 2013). Therefore, our construction industry plays an important role and gives negative impacts on the environment. In order to cope with this challenge, Malaysian construction industry has been urging to use innovative construction technique and to shift from traditional practice to IBS construction method. Nevertheless, studies on the assessment of embodied energy and CO_2 of building projects in Malaysia are scarce. It is necessary to acknowledge embodied energy and carbon emission amongst other factors in selecting construction method for projects.