UNIVERSITI TEKNOLOGI MARA

THE STRUCTURAL BEHAVIOUR OF PREFABRICATED WALL CONSTRUCTED USING WOOD-WOOL CEMENT COMPOSITE PANEL

MOHAMMAD SOFFI BIN MD NOH

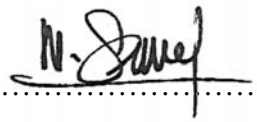
PhD

May 2020

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Mohammad Soffi Bin Md Noh
Student I.D. No.	:	2012299982
Programme	:	Doctor of Philosophy (Structure) – EC990
Faculty	:	Civil Engineering
Thesis Title	:	The Structural Behaviour of Prefabricated Wall Constructed Using Wood-Wool Cement Composite Panel
Signature of Student	:	 ……..
Date	:	May 2020

ABSTRACT

Nowadays, the Malaysian government has aggressively promoted the new construction technique, namely as Industrialized Building System (IBS). The use of IBS component in building construction significantly minimizes the cost, speed up the construction period, reducing the dependent on foreign labor and minimize the construction waste. However, the IBS components are produced from non-renewable resources, highly carbon emission and heavy weight. In view of this, the prefabricated wall constructed using wood-wool cement panel (WWCP) has been developed as a new load bearing wall system for low rise building. In the current practice, the construction technique of the WWCP wall is similarly as the brick or block laying process where, the WWCP were vertically stacked in running bond pattern to form a wall panel. This technique was seen not well established in terms of load carrying capacity and consumed the long construction period. Due to this, an experimental investigation to study the structural behaviour of wall fabricated with different WWCP arrangement and joint technique subjected to a different loading condition is undertaken. The new panel arrangement technique has been proposed by integrating a strip of 50 mm thickness of WWCP in two layers at different arrangement of panel orientation. The front side of the strip panels has been horizontally laid in the longitudinal direction, whereas rear side in transverse direction. The front and rear side panels were bonded together using 15 mm thickness of cement mortar to form a stable wall panel. The wall panels then, was plastered with the 16 mm thickness of cement mortar on both surfaces. There are three different square wall sizes of 600 mm, 1200 mm and 2400 mm were considered and tested under axial compression, diagonal compression and in-plane lateral load up to failure. The structural behaviour in terms of ultimate load carrying capacity, load-displacement profile and failure mode behaviour of the wall panels were observed and recorded through out of the experimental program. The experimental results revealed that the new developed full scale prefabricated wood-wool wall panel exceeded 5 times load bearing capacity of a double storey house which achieved the compressive strength of 432.73 kN/m. This lightweight prefabricated wood-wool wall panel shows a great potential to be developed further as one of the IBS load bearing wall system in Malaysia.

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah for giving me the opportunity to embark on my PhD and for completing this long and challenging journey successfully. My gratitude and thanks go to my main supervisor Professor Dr. Zakiah Ahmad, Professor Dr. Azmi Ibrahim as my first co-supervisor and Professor Dr. Peter Walker as my second co-supervisor.

My appreciation goes to my employer of Universiti Tun Hussein Onn Malaysia as giving me an opportunity for study leave and the Ministry of Higher Education Malaysia (MOHE) as giving me the scholarship and research fund via grant schemes of ERGS and PRGS.

My appreciation also goes to the faculty members, Laboratories crews who provided the facilities and assistance during sampling and testing. Special thanks to my colleagues and friends for helping me with this project.

This thesis is dedicated to the loving memory of my very dear father and late mother for the vision and determination to educate me. This piece of victory is dedicated to both of you. Finally, this valuable contribution also dedicated to my lovely wife Mdm. Sarini Abdullah and my children Ariff, Iffah and Hasiff for their patient and kind of support along my PhD journey. Alhamdulillah

TABLE OF CONTENTS