EMBODIED ENERGY ANALYSIS OF A PRECAST BUILDING SYSTEM

Dissanayake Mudiyanselage Kasurika Widvanga Dissanayake

(158016N)

Degree of Master of Science

Department of Civil Engineering

University of Moratuwa
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Dissanayake Mudiyanselage Kasurika Widvanga Dissanayake

(158016N)

Thesis submitted in partial fulfillment of the requirements for the degree Master of Science/ Master of Engineering in Electrical Engineering

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DECLARATION

“I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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D. M. K. W. Dissanayake Date:

The above candidate has carried out research for the Masters Dissertation under our supervision.

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Prof. (Mrs.) C. Jayasinghe Date:

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Prof. M.T.R. Jayasinghe Date:

ABSTRACT

Buildings are evolving throughout the history of mankind. When a new building system is introduced, the usual evaluation method is the monetary value. The adaptability to the climate conditions, structural capabilities and constructability are some other criteria for the evaluation. The building industry is consuming a vast amount of natural resources and also been responsible for a significant energy usage. With the recent developments in the environmental concerns all over the world, there is an increased the attention for the building sector. Due to the above reason new buildings have to be more environmental friendly than more conventional building systems.

A novel walling system has been considered in this study, which consist of lightweight foam concrete panels manufactured with recycled expanded polystyrene (EPS) up to 50% of the total volume. Even though those panels have lot of advantages over the conventional construction methods, they need to be compared with the other conventional methods for the environmental aspects. Embodied energy analysis is such an established method to quantitatively analyse the environmental impact caused by a product. Therefore, detailed study was carried out to determine the embodied energy of those foam concrete panels. A comparative study carried out using a typical single storey and for a two-storey house and different building materials.

Final results done for the case studies, indicated that houses constructed with cement sand blocks has the least amount of embodied energy and embodied carbon. However, houses constructed with EPS based lightweight foam concrete precast panels, can be a good competitor in terms of embodied energy and embodied carbon analysis, since it yields results much closer to the cement sand blocks. Reduced sand usage of EPS panelled walls is also an added advantage. Hence, it has the potential to be promoted as a mainstream walling material.

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Abbreviation	Description
EE	Embodied Energy
EPS	Expanded Polystyrene
LCEA	Life Cycle Energy Analysis