



Strength and Durability Characteristics of Coconut Fibre Reinforced Earth Cement Blocks

Kirupairaja Thanushan, Youganathan Yogananth, Pooraneswaran Sangeeth, Juthathatheu Gracian Coonghe, and Navaratnarajah Sathiparan

Department of Civil Engineering, University Jaffna, Kilinochchi, Sri Lanka

ABSTRACT

The study investigated the improvements in post-peak resistance induced by the introduction of coconut fiber in earth cement blocks. Earth cement blocks reinforced by coconut fiber of various fiber weight fractions were tested under axial compression and flexural loading to examine the response of the material in terms of peak load-carrying capacity, post-peak residual strength and toughness. It was observed that the coconut fiber reinforcement greatly improved the residual strength, ductility and energy absorption of the earth cement blocks. For durability, against the alkaline attack and the acid attack was reduced by the addition of coconut fiber in the mortar. Similar durability improvement shows against freeze-thaw and wet-dry cycle.

KEYWORDS

Earth cement block; coconut fibre; strength; durability

Introduction

The use of locally available material for house construction is preferable for social, environmental and economically sustainable construction. Generally, for construction, concrete or fire brick masonry prefers over earth construction due to much better performance. However, in developing countries, where low-cost construction is expected, earth masonry continues to be an important construction material. Also, there is a renaissance in the use of local soil due to their cost and energy efficiency compared to other construction materials such as concrete or brick masonry. Especially the scarcity and cost of river sand increase dramatically in recent years, construction industries try on local soil as river sand replacement.

House owners attempt to produce earth cement blocks (ECB) following traditional manual block casting method or construct as cement stabilized rammed earth walls. The ECB is a mix of soil, cement, and water with the consistency of cement blocks, which is cast into a block mold. Even though, these materials satisfied the strength requirement by local standards, due to its brittleness nature and limited ability to dissipate energy raise concern for its application. Additives or stabilizers are typically used to overcome these drawbacks and in general to improve particular properties of the material. A wide range of modifiers, including binders (cement, lime) and synthetic or natural fibers (coconut fiber, oil palm, bagasse, wool, straw) have been in fact used in earthen construction. Although synthetic fibers reinforced soil blocks are showing better mechanical and durability performance than natural fibers reinforced blocks, there is interest in the application of natural fibers in blocks due to environmental concerns (Hejazi et al. 2012). The coconut fiber, sisal, palm, jute, flax, barely straw, cane, and bamboo are commonly used natural fibers for reinforced of concrete blocks, adobe and compressed earth blocks. Published literature has found positive effects

CONTACT Navaratnarajah Sathiparan  nsakthiparan@yahoo.com  Department of Civil Engineering, University Jaffna, Kilinochchi, Sri Lanka

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/WJNF.