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Performance of coconut coir reinforced hydraulic cement mortar for surface plastering application

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HIGHLIGHTS

- Possibility of coconut coir for surface mortar reinforcement was investigated.
- Coconut coir in the mortar tends to slightly reduce bulk and dry density.
- Water absorption, porosity, sorptivity were increased with coconut coir fraction.
- The strength of mortar improved with additions of coconut coir up to 0.5% fraction.
- Presence of coconut coir improve post-crack behavior of mortar.

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ABSTRACT

This study was to investigate the effect of coconut coir on the strength and durability properties of cement-lime surface plaster mortar. The purpose of adding coconut coir into the mortar was due to coconut coir had a capacity in controlling cracking in the mortar. In this study, total 115 samples were prepared which were 100 cubes (150 mm × 150 mm × 150 mm) and 15 beam prisms (100 mm × 100 mm × 500 mm). Testing was included; water absorption, porosity, sorption rate for physical properties; acid attack resistance, alkaline attack resistance for durability properties; compression and flexural bending for strength properties. The samples were tested with mortar containing 0.125%, 0.25%, 0.50% and 0.75% of coconut coir. The percentage of coconut coir fraction was calculated based on the cement, lime, sand mix by mass. Test results show that, although compressive and flexural bending strength are not improving, but post crack properties such as ductility, residual strength, and toughness are increased with higher coconut coir fraction in the matrix.

1. Introduction

Masonry is brittle materials that are stronger in terms of compression, while weaker in terms of shear and flexural bending. Because of masonry is a quasi-brittle material and it has not any significant post crack strength, once a crack initiates, the masonry experiences a sudden failure [1].

Based on post-earthquake damage surveys [2–4], the major types of masonry failure modes have been identified as in-plane diagonal cracking, out-of-plane wall collapse, separation of adjacent walls, differential settlement, torsional stress, and cracking due to stress concentrations around openings.

There are various reinforcement/retrofitting technologies had been developed. They can mainly categories as follows;

- Restoration: Surface treatment using shotcrete, Ferro cement, Stitching and grout/epoxy injection, re-pointing with ordinary Portland cement, install/upgrade of wall/diaphragm connection [5–8].
- External reinforcement: Bamboo with the horizontal wire band, Seismic Wallpaper, polymer plate bonding, jacketing, near surface mounted reinforcement [9–11].
- Post-tensioning: Rubber tires [12], Steel bars [13].
- Mesh type reinforcement: Steel mesh [14], Polymer mesh [15], Polypropylene band [16], Bamboo mesh [17], Plastic carrier bag mesh [18].

Research done on this retrofitting method for masonry structures shows that these methods have improved the seismic behavior of the masonry structures. However, suitability of any retrofitting technique should guarantee not only its efficiency in terms of improvement of the seismic behavior of the masonry

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