



Use of Quarry Dust in the Binding Mortar and Its Effect on Mechanical Characteristics of Brick Masonry

Kosalya Sundaralingam¹, Arvinthan Peiris¹, Navaratnarajah Sathiparan^{1*}

¹Department of Civil Engineering, Faculty of Engineering,
University of Jaffna, Sir. Pon, Ramanathan Rd, Jaffna, SRI LANKA

*Corresponding Author

DOI: <https://doi.org/10.30880/ijscet.2022.13.01.021>

Received 09 March 2022; Accepted 13 March 2022; Available online 16 May 2022

Abstract: The strength characteristics of masonry is greatly affected by the brick strength, mortar strength and bond between brick-mortar interface. Especially, binding mortar significantly affects the shear and flexural strength of the masonry. In conventional masonry construction, river sand or natural sand is mixed with cement and used as binding mortar. However, due scarcity of good quality river sand, the extensive focus is on finding alternative materials for river sand for construction purposes. Quarry dust is one of the best alternatives for river sand, which can be used as fine aggregates in binding mortar. This study investigates the strength characteristic of the masonry made of quarry dust incorporated binding mortar instead of conventional cement-sand mortar. The binding mortar with four different river sand replacement levels of 0%, 33.3%, 66.7% and 100% quarry dust, was used for construction masonry. Compression test, direct shear test and cross-couplet test were conducted to evaluate the strength characteristic. The test results revealed that compressive, shear and bond strength of masonry was improved with increased quarry dust content in the binding mortar.

Keywords: Masonry, binding mortar, river sand, quarry dust, characteristic strength

1. Introduction

Binding mortar (joint layer mortar) has a pivotal role in the mechanical characteristics of masonry. A good bond between masonry unit and binding mortar contribute to improvement in compression, shear and bond strengths. The bond between masonry unit and mortar is influenced by several factors such as surface roughness of brick, water absorption rate of the brick, initial moisture content of the brick, sand grading used for binding mortar, mortar composition, mortar consistency and water retention capacity of the mortar [1-3]. In conventional masonry construction, river sand or natural sand is mixed with cement and used as binding mortar. The major constituent of the binding mortar is river sand and it is contributed 80% to 90% by volume.

In recent years, due to the rapid growth of construction activities, the demand for river sand is increased but the supply of river sand has not satisfied this demand. This is due to the strict restriction of sand mining from river bed as over-exploration of sand from river bed create a lot of adverse environmental impacts [4-5]. Due to that, in addition to the scarcity of river sand, the supplied river sand is also not in recommended quality. Therefore, in recent years, the extensive focus is on finding alternative materials for river sand for construction purposes.

There is widespread published literature on using agricultural waste [6-9], industrial waste [10,11], construction and demolition waste [11-13] and lateritic soil [14] as river sand replacement for construction materials. Published literature shows that incorporating these alternative materials, in construction materials such as concrete, cement blocks, and stabilized soil blocks is not only satisfied the strength and durability requirement but also the production is more cost-