UNIVERSITI TEKNOLOGI MARA

THE EFFECT OF KENAF CORE AND QUARRY DUST AS SAND REPLACEMENT IN SAND CEMENT BRICKS

MOHD ZA'IM BIN MOHD NOR

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ABSTRACT

Construction sector is focusing in developing sustainable, green and eco-friendly building materials as well as requirement for producing lightweight product. High demand and dependency of sand for construction industry caused a shortage of resources in future. Alternative resources are needed as replacement of sand. This research studies the effect of kenaf core and quarry dust as sand replacement in sand cement brick. The investigations cover heat of hydration, compressive strength, density, water absorption and porosity of Kenaf Core Quarry Dust Bricks (KCQB). Properties of normal sand cement brick was used as control parameters to see the effect of kenaf core and quarry dust. A series of mix designs was prepared and noted as cement paste without aggregate (M0), normal sand brick (M1), contain 100% quarry dust (M2) and contain 100 % kenaf core (M3) and ten (10) types of mixes containing different percentage of kenaf core and quarry dust noted as M4, M5, M6, M7, M8, M9, M10, M11, M12 and M13. Sand was replaced by 75% quarry dust fixed for every mix and the balance 25% of sand was partially replaced by kenaf core as variable until the use of sand be zero. A range of 2.5% (M4), 5% (M5), 7.5% (M6), 10% (M7), 12.5% (M8), 15% (M9), 17.5% (M10), 20% (M11), 22.5% (M12) and 25% (13) sand replacement with kenaf core was used in the cement: sand mix ratio of 1:6 and the water cement ratio is 0.6. Results shows that the inclusion of kenaf core as fine aggregate has reduce a heat of hydration of cement. Based on the result from this research, the optimum percentages of kenaf core to be used in brick was made by using 17.5% of kenaf core, M10 (Q75 K70). The compressive strength of M10 at 28 days is 10.91 N/mm2, the compressive strength has met the minimum requirement of load bearing strength accordance to Public Work Department while the standard is 5.2 N/mm2. While the density is 1840.89 kg/m3 is lower compared to M1 with value 2054.96 kg/m3, this indicate that kenaf core will produce lightweight bricks. The water absorption of M10 is 11.93%, according ASTM C90, the percentage of water absorption of brick should be less than 12% at 28 days of ages. Besides, the porosity of M10 is 22.39% at 28 days of ages.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Nowadays, construction sector focuses in the development of sustainable, green and eco-friendly building materials. Construction materials including bricks, wood, cement, aggregate, steel, aluminium, cladding and partitioning material are increasing in demand due to rapid growth of construction activities for housing and other building. The current world economic circumstances are unstable because of the world exchange currencies are getting very competitive and the cost of building materials also soared. These situations led to several ongoing construction projects are having difficulty in getting the materials at lower cost. Therefore, there are needs to search an alternative material in order to fulfil the constructions demand while maintaining the cost at minimum level and having sustainable material (Noor Zawati *et al* 2015).

The worldwide consumption of sand as fine aggregate in mortar and concrete production is very high and several developing countries have met some strain in the supply of sand in order to meet the increasing demands of construction development. In many countries there is a shortage of natural fine aggregate which is suitable for construction. Sand is most common material which used as natural fine aggregate. In general, in the last 15 years, it has become clear that the availability of good quality of natural sand continues in decreasing. The shortage of the resources of natural sand opened the door for using by products and cementitious materials as a source of fine aggregate. Reuse of by products as a partial or full replacement of natural fine aggregate in construction activities not only reduces the demand for extraction of natural raw materials, but also saves landfill space and reduce the consumption of natural resources (A.Rashad 2016). Although several researches have been conducted to determine the potential of natural resources either by-product materials or waste materials to be used as aggregate replacement material, the acceptant of this product is still very limited.

The successful utilization of a waste material depends on its use being economically competitive with the alternate natural material. These costs are primarily made up of handling, processing and transportation. The waste materials that can be