EFFECTS OF SUGARCANE FIBER IN THE NON-LOAD BEARING CAPACITY OF CONCRETE HOLLOW BLOCKS

Design Project

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ABSTRACT

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The new generation continually demands for the development of the industry. Thus, building new infrastructures increases. With this development, the need of construction materials grows. The concept of construction advancement is beneficial to many, but with significant effects to the environment where the material came from. Sand is one of the raw materials in many construction projects. The demand for sand gradually increases. Sand mining, one of the way to generate sand, can cause deterioration to the river banks or any nearby structures. One of the development in the industry is the use of different substances in replacement for the common used materials. Agricultural waste such as bagasse is being disposed in the environment. This study focused on the use of sugarcane fiber as a partial replacement for the sand in the concrete hollow blocks. Concrete hollow block (CHB) is one of the most widely used construction material. The research aimed to determine the different properties of the fiber used in the study, as well as to evaluate its effects in the compressive strength and mass density of the CHBs. Fine aggregate has a fineness modulus of 3.00-4.00. The obtained fineness modulus for the sugarcane fiber is 3.99, thus it can be considered as fine aggregate. It has a compact mass density of 99.98 kg/m^3 and a loose mass density of 51.98 kg/m^3. It has a water absorption of 1.30. Four treatments were prepared for the study, with nine specimens each. The prepared percentage replacements were 0%, 20%, 30%, and 40% by cement volume. The proportion used for cement to sand is 1:7 with the Philippine standard size of 40cm:

20cm: 10cm. Three samples from each treatment were prepared to subject to the 7^{th}, 14^{th}, and 28^{th} day compression test. The average compressive strength of the control passed the Philippine National Standard (PNS) of 2.41 Mpa (350psi) for an average of three CHBs. The results showed that the optimum compressive strength of CHB with sugarcane fiber when with 20% mixture (0.94Mpa on the 28^{th} day). However, this treatment did not pass the PNS. It was concluded that as the amount of bagasse increases, the compressive strength of the CHB decreases. The average mass of the concrete hollow blocks showed that as the amount of the bagasse increases and as the curing day takes longer, the mass of the CHB decreases. The least mass of the CHB can be obtained when its aggregate is replaced by 40% (951.80kg/m^3 on the 28^{th} day). The results of the research showed that only the control passed the PNS, thus CHBs without sugarcane fiber can be used as non-load bearing concrete hollow blocks for structures. As for those CHBs that did not pass the PNS, it is not advisable to be used as a walling material or on any structure requiring the minimum 2.41Mpa of the PNS.

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INTRODUCTION

Concrete hollow block (CHB) is made from a mixture of cement, aggregates and water. It is also referred to as concrete masonry unit (CMU).

Compared to other construction materials, CHBs are relatively low cost and easier to install by semi-skilled labourers. This is the reason why CHB is one of the general used walling materials in the Philippines. CHB walls are vulnerable against lateral loads (pushing or pulling forces from typhoon or earthquake). To increase their resistance against these lateral loads, steel reinforcing bars are added horizontally and vertically. Substandard bars immensely reproduce in construction stores and hardware due to high costs of steel bars. This leads to the rural and other suburban construction resulting to a low quality type of structure.

It is known that concrete hollow blocks are weak against lateral loads. But the materials that are usually used to overcome those deficiencies are more