THE EFFECT OF DIFFERENT SIZES OF SHREDDED NEWSPAPER ON COMPRESSIVE STRENGTH OF MORTAR

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Thesis submitted in fulfilment of the requirements for the award of the degree of
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JUNE 2016

SUPERVISOR'S DECLARATION

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ABSTRACT

Usage of natural sand as fine aggregate in the concrete mixture industry has become too dependent of this natural resource which took time to be produced. At the same time, production of paper has led to cause the dumping of rubbish in the world is increasing day by day. The objectives of this research are to investigate the properties of mortar using waste newspaper to substitute a portion of fine aggregate. This is one of the approaches to reduce the usage of natural resource and amount of waste paper dump at the landfill. This research used to investigate the effect of different sizes of shredded newspaper on mortar when the specimens were subjected to compression strength test and water absorption test. The mix design used is normal mortar mix which 1:2 ratio of cement and water respectively in addition of wet shredded newspaper with comes with two sizes collected from two offices in Universiti Malaysia Pahang. The size of the cube is 100x100 mm were cured with two types of method that are inside and outside room temperature before undergoing tests. The finding shows that specimens containing bigger size of shredded newspaper have higher compressive strength than smaller size. It is also observed that specimens with smaller size of shredded newspaper has lower rate of water absorption compared to specimens containing bigger size of shredded newspaper.

ABSTRAK

Penggunaan pasir sebagai agregat dalam industri campuran konkrit menjadi terlalu bergantung kepada sumber alam semula jadi, dimana sumber ini yang mengambil masa yang lama untuk dihasilkan. Pada masa yang sama, pengeluaran kertas yang banyak setiap hari telah membawa kepada lambakan sampah di dunia semakin meningkat hari demi hari. Objektif kajian ini adalah untuk mengkaji kebolehkerjaan mortar menggunakan akhbar lama menjadi ganti sebahagian daripada agregat untuk mengurangkan penggunaan sumber alam semula jadi dan mengurangkan lambakan sampah akibat sampah seperti kertas. Tujuan kajian ini adalah untuk menentukan kekuatan mampatan dan kadar penyerapan air. Reka bentuk campuran yang akan digunakan adalah campuran mortar biasa iaitu nisbah simen dan air 1: 2 yang dicampurkan dengan akhbar lama basah yang telah dikisar. Akhbar lama dihasilkan dengan dua saiz yang dikumpul daripada dua iaitu pejabat Fakulti Kejuruteraan Awam dan Sumber Alam dan makmal konkrit di Universiti Malaysia Pahang. Saiz kiub adalah 100x100mm manakala kaedah pengawetan, mortar berada di dalam dan di luar suhu bilik sebelum diuji dengan dua cara. Setelah kajian dijalankan, kekuatan mortar yang mengandungi potongan akhbar yang bersaiz besar mempunyai kekuatan lebih daripada mortar yang mempunyai potongan akhbar yang bersaiz kecil. Untuk kajian serapan air, mortar yang mengandungi potongan akhbar bersaiz kecil mempunyai kadar serapan air lebih rendah daripada mortar yang mengandungi potongan akhbar bersaiz besar.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

For a thousand years, sand and gravel have been used in the construction of roads and buildings. Today, demand for sand and gravel still continue to increase. Malaysia is a one of developing country in term of technology and construction. Usage of natural resources such as sand as aggregate in concrete mixture has become too sole dependant of this natural resource which took time to be produced. The issues of natural aggregate depletion have been mentioned by Bjork (1999). In twenty to thirty years from now, our grandchildren would possibly unable to use those natural resources due to excessive usage during our time and somehow it would lead to costly in conserving these resources.

Excessive instream sand-and-gravel mining causes the degradation of rivers. Instream mining lowers the stream bottom, which may lead to bank erosion. Depletion of sand in the streambed and along coastal areas causes the deepening of rivers and estuaries, and the enlargement of river mouths and coastal inlets. It may also lead to saline-water intrusion from the nearby sea. The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system. (Ako et al., 2014)

In the meantime, production of paper has led to cause the dumping of rubbish in the world is increasing day by day (Hoornweg et al., 2013). Paper is one of the objects used by everyone every day. Regardless of age and anywhere, in kindergarten, school, university, office, house, paper is very easy to find because it is cheap and easily

created. Therefore, paper became one of the top wastes in Municipal Solid Waste (MSW) chart and newspaper is included in the types of paper waste. Because of that, waste dumping has become an environmental pollution that costly to dispose and also gives bad effects to human health.

1.2 PROBLEM STATEMENT

As a result of rapid development, concerns toward preserving natural resource such as sand for future generation has led to approaching the integrating of waste materials. At the same time, dumping of waste in landfill has become environmental pollution and also costing to dispose and one of the major wastes is paper. In this study, the main focus is using newspaper waste as a partial sand replacement in mortar material.

1.3 OBJECTIVES OF STUDY

This study was conducted to achieve the following objectives:

i. To investigate the effect of different sizes of shredded newspaper on compressive strength of mortar with two methods of curing.

ii. To investigate the effect of different sizes shredded newspaper on water absorption of mortar with two methods of curing.

1.4 SIGNIFICANCE OF RESEARCH

This study will provide the knowledge on the behavior of mortar with newspaper as replacement of sand when it is subjected to compressive strength and water absorption. From the research, we will able to discover the effect of shredded newspaper as partial of sand replacement towards the performance capacity of mortar. The information is expected to contribute towards better understanding of this modified mortar so that further research can be carried out to develop papercrete that able to

perform well like normal mortar and at the same time to offer an alternative usage of sand in construction.

1.5 SCOPE OF RESEARCH

This research focus on the workability of mortar with a mixture of different sizes of shredded newspaper as partial sand which collected from two offices in Universiti Malaysia Pahang (UMP). The sizes of shredded newspapers are 2 x 8 mm from FKASA office and 3 x 25 mm from concrete laboratory office.

100 x 100mm mortars were produced from 1.5kg mixture of normal mortar mix with shredded newspaper as partial of sand. Then it undergoes two types of curing which are inside the concrete laboratory and the parking lot outside the concrete laboratory in the UMP. The curing ages are 28, 60, 90 and 120 days. The tests on the mortar were carried out inside the concrete laboratory.

1.6 LAYOUT OF THESIS

Chapter one contains the introduction and problem statement of the research, the objectives, significance of research and scope of research were also highlighted t describe the purpose of the research. Chapter two elaborates about the characteristics of waste paper and its influence on properties of mortar.

Chapter three describes the experimental details. The methodology begins with elaboration on the preparation of materials such as shredded paper and then followed by the mortar preparation according to the concrete mix design.

Chapter four discusses the results of compression strength and rate of water absorption test. The results obtained were analysed and presented in the form of graphs and tables. Finally, chapter five presents the conclusion and recommendations for future study.