THE PROPERTIES OF CEMENT-SAND BRICK CONTAINING DIFFERENT TYPE OF SHREDDED PAPER AS MIXING INGREDIENT

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MOHD AYAZ BIN MOHD ABDUL NASSIR

Thesis submitted in fulfillment of the requirements for the award of the degree of
B. Eng (Hons.) Civil Engineering

Faculty of Civil Engineering and Earth Resources
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LIST OF SYMBOLS

%	Percent
MPa	Megapascal
mm	Millimeters
N	Newton
N/min	Newton per minute
cm^2	Centimeter square
in^2	Inches square
kg/m^2	Kilogram per meter square
psi	Per square inches
kPa	Kilopascal

LIST OF ABBREVIATIONS

CH_4	Methane
CO_2	Carbon Dioxide
FKASA	Fakulti Kejuruteraan Awam dan Sumber Alam
GHGs	Greenhouse Gas
JHEPA	Jabatan Hal Ehwal Pelajar dan Alumni
SIRIM	Standards and Industrial Research Institute of Malaysia
ASTM	American Society of International Association for Testing & Materials
MS	Malaysian Standard

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ABSTRACT

Several tons per day of pulp and paper solid waste are produced by paper mills and also generated from the household worldwide. By dumping all of this waste paper in the landfill or went through the incineration process, it will cause direct adverse effect towards the environment. Utilization of waste paper in producing a new construction material is seen as one of the ways to protect the environment. This study will provide the knowledge on the properties regarding the compressive strength and flexural strength when using different type of shredded waste paper as mixing ingredient to produce cement-sand brick. There are two type of shredded waste paper were used throughout this research, which is shredded newspaper and shredded simile paper. For this research, three different types of cement sand-brick were made. For Mix 1 and Mix 2, each will contained 2x8 mm and 3x25 mm shredded simile paper as one of the mixing ingredient respectively. While for the Mix 3, it contained 2x8 mm shredded newspaper as one of the mixing ingredient. The size of the specimens produced is 200x100x72 mm (length x width x height). Air curing is used as the curing method for the specimens. The curing durations are 30 and 60 days period. This experiment revealed that the compressive and flexural strength of the cement-sand brick contained shredded waste paper increase as the curing duration become long. This experimental studies also revealed that shredded newspaper with the size of 2x8 mm is the best type and size of shredded paper to be used as partial sand replacement to produce cement-sand brick in the future.

ABSTRAK

Beberapa tan sehari pulpa dan kertas buangan pepejal yang dihasilkan oleh kilang-kilang kertas dan juga dihasilkan daripada isi rumah di seluruh dunia. Dengan lambakan semua kertas buangan ini di tapak pelupusan atau telah melalui proses pembakaran, ia akan menyebabkan kesan buruk secara langsung terhadap alam sekitar. Penggunaan kertas buangan dalam menghasilkan bahan binaan baru dilihat sebagai salah satu cara untuk melindungi alam sekitar. Kajian ini akan memberi pengetahuan tentang sifat-sifat mengenai kekuatan mampatan dan kekuatan lenturan apabila menggunakan pelbagai jenis kertas buangan dicincang mencampurkan ramuan untuk menghasilkan bata simen-pasir. Terdapat dua jenis kertas buangan dicincang yang digunakan sepanjang kajian ini, yang dicincang akhbar dan kertas simile dicincang. Untuk kajian ini, tiga jenis bata simen-pasir telah dihasilkan. Untuk Mix 1 dan Mix 2, masing-masing akan mengandungi 2x8 mm dan 3x25 mm kertas simili yang telah dicincang sebagai salah satu bahan campuran. Manakala bagi Mix 3, ia mengandungi 2x8 mm surat akhbar yang telah dicincang sebagai salah satu bahan campuran. Saiz spesimen yang dihasilkan adalah 200x100x72 mm (panjang x lebar x tinggi). Pengawetan udara digunakan sebagai kaedah pengawetan bagi spesimen dan jangkamasa penyembuhan adalah 30 dan 60 hari. Eksperimen ini menunjukkan bahawa kekuatan mampatan dan lenturan bata simen-pasir mengandungi kertas buangan yang dicincang semakin meningkat berdasarkan peningkatan masa pengawetan. Kajian ini juga mendedahkan bahawa surat akhbar dicincang dengan saiz mm 2x8 adalah jenis dan saiz terbaik untuk digunakan sebagai salah satu bahan pengganti pasir untuk menghasilkan bata simen-pasir pada masa hadapan.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Issues on the problem of pollution are one of the topics which often have been discussed by the world community. Pollution, which also commonly related to environmental pollution, is a problem with the addition of any substance that comes in the form of solid, liquid or gas. Modern society is also concerned and worried about the specific type of pollution, which is pollution caused by the waste paper towards the environment. Generally, all the pollution is caused and produced by human being itself.

In today's electronic age, people would consider and start to implement the paperless generation. Even though this is a great and wise idea in order to protect the environment, but there is a long way to go. This is because the paper is still considered as one of the very important products which human really depend on it every day. Besides from ended up all the waste paper at the landfill and by doing the incineration process, we might found a better way of recycling all this waste. This recent research investigates the effect using a different type of shredded waste paper as one of the mixing ingredients to the properties of a cement-sand brick.

1.2 PROBLEM STATEMENT

To meet the increasing of demand for the paper based products, paper mills around the world produced huge amounts of pulp and paper solid waste which counted to be several tons per day. In fact, this waste has been found to be the 3rd largest industrial polluter of air, water and soil (Das et al., 2016). Besides that, from paper wrappings to newspaper it turned to be the main source of this paper wastage. By having this huge amount of waste every year, the issue related to disposal and management of this waste has automatically become a serious global problem.

Different conventional strategies such as landfilling, compositing, incineration and recycling are being adopted, but yet those methods are not found to be safe for environmental and human health (Fikru, 2014). Malaysia is overburden with waste materials including the waste paper and to dump these materials to landfill, there are no spaces or areas available left. Concern towards this serious problem regarding the waste paper, it has lead the approaches of using a different type of shredded waste paper as the partial sand replacement material when produced cement-sand brick.

1.3 OBJECTIVES

This study was conducted to achieve the following objectives:

i) To study the effect of using different type of shredded paper on compressive strength of the cement sand brick.

ii) To study the effect of using different type of shredded paper on flexural strength of the cement sand brick.

1.4 SIGNIFICANCE OF RESEARCH

This study provides knowledge of the effect on the properties of cement sand brick when using different type of shredded paper as one of the mixing material. From the research, we will be able to discover the compressive strength and flexural strength of cement sand brick containing waste paper as mixing ingredient. All of this information is expected to contribute towards a better way of recycling all the paper waste rather than dumping it at the landfills or by doing the incineration process, which is not very environmentally friendly. Besides that, this research also somehow would give a new invention of building material to our construction industry.

1.5 SCOPE OF RESEARCH

This study concentrates on the properties of cement-sand brick containing different type of shredded paper as one of the mixing material. At the beginning of this study, 3 different types of cement-sand brick's mix were made. For Mix 1 and Mix 2, it contained 2x4 mm and 3x25 mm shredded simile paper as one of the mixing ingredients. While for the Mix 3, it contained 2x4 mm shredded newspaper as one of the mixing ingredients.

Throughout this research, air curing was used as the curing method for those cement-sand brick. The durations for the curing process are 30 and 60 days. The size of the brick prepared is 200 x 100 x 72 mm which based on the standard market size of the brick. After all the specimens going through the curing process, it subjected to two different tests which is compressive strength test and flexural test. Then, all the result from the test then compared with the actual compressive and flexural strength from the clay and cement-sand bricks which available at the market.