STUDY OF SAND BRICK RATIO 1:3 FOR PARTIAL REPLACEMENT OF SAND WITH PALM KERNEL SHELLS (0%, 10% AND 20%)

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B.ENG (HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

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Thesis submitted in fulfilment of the requirements
for the award of the degree
of Bachelor Civil Engineering

Faculty of Civil Engineering and Earth Resources
Universiti Malaysia Pahang

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor (Hons.) of Civil Engineering

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award for other degree.

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This hard work is dedicated to my beloved family and my precious friends who love me and support me during my whole journey of education at University of Malaysia Pahang.

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LIST OF ABBREVIATIONS

PKS	Palm Kernel Shells
JKR	Jabatan Kerja Raya
FKASA	Fakulti Kejuruteraan Awam dan Sumber Alam
OPC	Ordinary Portland Cement
BS	British Standard
ASTM	American Standard Test and Method

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ABSTRACT

In this study, samples of sand brick that added with palm kernel shells (PKS) are produced to determine the best compressive strength of sand brick and to identify the best water absorption of sand brick with different percentages. There are 3 different percentages which are 0%, 10% and 20% will be replaced with the sand. The size of sand brick is 225mm x 113mm x 75mm. There are 120 bricks with three different percentage of ratio palm kernel shells are produced 20 samples for each percentage for 7 days and 28 days to get the average results of the compressive strength and water absorption. The outcome of these results is to compare the compressive strength and water absorption of sand brick are replaced with palm kernel shells and control samples. From the average of compressive strength by using air curing is decrease from 34.06 N/mm^2 until 22.66 N/mm^2 for 7 days and from 36.04 N/mm^2 until 24.86 N/mm^2 for 28 days while using water curing method also decrease from 33.00 N/mm^2 until 22.32 N/mm^2 for 7 days and from 34.63 N/mm^2 until 23.52 N/mm^2. Then, the average for water absorption by using air curing is increase from 2.41% until 5.35% for 7 days and from 2.64% until 6.33% for 28 days while by using water curing also increase from 2.67% until 6.24% for 7 days and from 2.94% until 6.63% for 28 days. This study will be useful to improve the strength of the sand brick by using smaller percentage from this study.

ABSTRAK

Dalam kajian ini, sampel bata pasir yang ditambah dengan sisa agrikultur iaitu tempurung kelapa sawit akan dihasilkan. Penghasilan ini dibuat bagi mengetahui kekuatan bata pasir yang mempunyai kandungan bahan tambah. Tempurung kelapa sawit dengan setiap peratusan penambahan didalam bancuhan rekabentuk telah ditetapkan iaitu sebanyak 0%, 10%, dan 20%. Saiz bata pasir adalah 225mm x 113mm x 75mm. Sebanyak 120 sampel dihasilkan dimana setiap bancuhan yang berbeza peratusan akan menghasilkan 20 biji bata. Separuh daripada jumlah sampel akan diuji pada usia ke 7 dan separuh lagi diuji pada usia ke 28 hari. Sampel bata ini diuji dengan dua ujian iaitu ujian kekuatan mampatan dan peratus penyerapan air menggunakan dua kaedah pengawetan iaitu pegawetan udara dan pengawetan air. Hasil daripada data yang diperolehi, nilai purata kekuatan mampatan bata menggunakan kaedah pengawetan udara adalah menurun daripada 34.06 N/mm^2 sehingga 22.66 N/mm^2 untuk hari ke 7 dan daripada 36.04 N/mm^2 sehingga 24.86 N/mm^2 pada hari ke 28 manakala menggunakan kaedah pengawetan air adalah menurun daripada 33.00 N/mm^2 sehingga 22.32 N/mm^2 untuk hari ke 7 dan daripada 34.63 N/mm^2 sehingga 23.52 N/mm^2. Berdasarkan peratus penyerapan air pula, nilai yang diperoleh menggunakan kaedah pengawetan air adalah menaik daripada 2.67% sehingga 6.24% untuk hari ke 7 dan daripada 2.94% sehingga 6.63% untuk hari 28 manakala menggunakan kaedah pengawetan udara adalah menaik daripada 2.41% sehingga 5.35% untuk hari ke 7 dan daripada 2.64% sehingga 6.33% untuk hari ke 28. Disebalik data penurunan untuk kekuatan mampatan ini, peratusan terbaik yang sesuai digunakan dalam kajian ialah sebanyak 10% menggunakan kaedah pengawetan udara memandangkan jumlah kekuatan mampatan tersebut pada hari ke 7 dan 28 menunjukkan penurunan yang paling sedikit berbanding bata kawalan dan data penaikan untuk peratus penyerapan air yang terbaik adalah 2.93% menggunakan kaedah pengawetan udara. Kesimpulannya, tempurung kelapa sawit berpotensi digunakan dalam penghasilan bata, namun jumlah peratusan bahan tambah yang lebih kecil dari 10% perlu dikaji pada kajian yang akan datang.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Construction field is one of the areas that give to the development of the country, not only in Malaysia but also abroad. The construction sector can be seen in terms of the demand for construction of residential houses, office buildings, premises of business and so are constantly increasing for the country to build and strengthen the economy. From the demand, the use of materials such as bricks in the construction field is greatly needed to develop.

Bricks are probably the oldest industrialized building material known to man. Brick is in a rectangle-shaped, made of inorganic materials that are hard and tough. There are various types and forms of brick, depending on the type and source of raw material, the method of manufacture and use. There are four main stages in the manufacturing process. There are preparations of bricks, the manufacturing stage, drying and heating stages. The earliest bricks are made from clay, taken from close to the surface of the ground, or from river banks, moulded into shape by hand and dried in the sun. Clay bricks over the centuries were traditionally made locally and not transported very far, so that they had widely differing characteristics depending on the material available and the way the bricks will be treated by the maker.

Therefore, the sand brick which acts as the main character has been selected in this study which added with palm kernel shells (PKS) in the mixture of the sand brick. In Malaysia, the palm oil industry is important because of the production and exportation the palm oil all around the world. So, the waste material of the palm oil will be producing many wastes in this country. From that waste, we can save our earth from

environmental pollution. Furthermore, in the construction industry, building materials brick is particularly important to interpret walls, roads, car parks and many more.

1.2 PROBLEM STATEMENT

Generally, the use of brick in construction is widespread, especially in the construction of buildings and infrastructure. Various studies will be conducted to produce variety methods that can add the strength of the brick. However, since the brick was exposed to the environment, it's a bit of a weakness (He et al., 2012). To overcome these weaknesses and to improve the brick strength, we will replacing the original composite brick with palm kernel shells based on the earlier studies that palm kernel shells was used in the making of bricks (Zakaria, 1987).

Palm kernel shell is one of the solid wastes from the process of agricultural production and palm kernel shells (Mamat, 2006) who mostly processed in the tropics (Shafigh et al., 2010). According to a statement issued in Berita Harian, seven percent palm kernel shells was produced for every tonne of palm oil bunches processed (Michael, 2006). By the way, if the waste is not reused indirectly may lead to increased problems of waste disposal of waste in landfills.

Detailed studies should be made to make sure that additional palm kernel shells can improve the strength of the brick itself. In addition, these studies rely on laboratory tests to get the right result. All data and processes of experiments conducted in the laboratory in addition to getting help from factories that operate brick manufacture or processing plant palm.

1.3 OBJECTIVES STUDY

The main objective of this study is to determine the effectiveness of sand brick and palm kernel shell as feedstock in the manufacture of brick.

The objectives of this research are:

i. To identify the best compressive strength of sand brick with the different percentage of palm kernel shell.
ii. To identify the best water absorption of sand brick with the different percentage of palm kernel shell.

1.4 SCOPE OF STUDY

This research is mainly focused on the compressive strength of sand brick with additional of palm kernel shells on the investigated samples. The control samples are designed with cement, sand, and water without any admixture. To ensure that the study can meet the proposed objectives, the scope of this study will include a review of the potential ability of bricks containing the admixture of palm kernel shells whether it seeks to achieve and exceed the standards of the brick strength or vice versa. Size of the sand bricks will be followed the Malaysia Public Works Department or *Jabatan Kerja Raya* (JKR) standard which is length (225 ± 3.2 mm), width (113 ± 1.6 mm) and height (75 ± 1.6mm). All the tests on the samples will be carried out on brick samples in the laboratory of the Faculty of Civil Engineering (FKASA).

The scope of work mainly focuses on:

i. The experiments that conducted are Compressive Strength Test and Water Absorption Test.
ii. The compression strength test conducting at 7 days and 28 days to get the strength of brick.
iii. The size of sand brick are follow JKR standard which is 225mm x 113mm x 75mm.
iv. The ratio of sand brick is 1:3, which are one part of cement and 3 part of sand.
v. The percentage of palm kernel shell were replacing sand at 10% and 20% replacement by volume of sand.

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