STUDY OF SAND BRICK RATIO 1:6 FOR PARTIAL REPLACEMENT OF SAND WITH PALM OIL CLINKER

(7.5%, 12.5% AND 17.5%)

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STUDENT'S DECLARATION

I hereby declare that the work in this project is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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

Faculty of Civil Engineering & Earth Resources

UNIVERSITI MALAYSIA PAHANG

MAY 2019

ACKNOWLEDGEMENTS

Foremost, I would like to express my sincere gratitude to my advisor Madam Shariza Bt Mat Aris for the continuous support of my Bachelor study and research, for her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and writing of this project. I could not have imagined having a better advisor and mentor for my Bachelor study.

I take this opportunity to express gratitude to all of the Department faculty members for their help and support. I also thank my parents for the unceasing encouragement, support and attention.

Last but not the least, I would like to thank my family, my parents Mohamed Shah Bin Mamat and Noor Hashimah Binti Kasim, for giving birth to me at the first place and supporting me spiritually throughout my life.

I also place on record, my sense of gratitude to one and all, who directly or indirectly, have lent their hand in this venture.

ABSTRAK

Penyelidikan sekarang berpunca daripada masalah alam sekitar yang ditimbulkan oleh pembuangan klinker minyak sawit, hasil sampingan industri kelapa sawit dan isu perlombongan pasir yang berlebihan. Oleh itu, kerja eksperimen telah dijalankan untuk menyiasat kesan kandungan klinker kelapa sawit sebagai pengganti pasir separa pada sifat bata. Sejumlah tiga campuran yang mengandungi pelbagai peratusan klinker minyak kelapa sawit, iaitu 7.5% 12.5% dan 17.5% telah disediakan. Semua spesimen adalah air sembuh dan udara sembuh sehingga tarikh ujian. Ujian kekuatan mampatan, ujian kekuatan lenturan dan ujian penyerapan air dijalankan pada 28 hari, 60 hari, dan 90 hari. Penemuan menunjukkan bahawa penggabungan klinker 7.5%, 12.5% dan 17.5% klinker minyak sawit menyumbang ke arah penggabungan campuran yang meningkatkan kekuatan mampatan, kekuatan lenturan, ketumpatan dan ujian kadar penyerapan air bata. Penyerapan air bata meningkat sedikit apabila klinker minyak sawit disepadukan sebagai pengganti pasir separa. Pada keseluruhannya, kualiti bata yang baik dapat dihasilkan dengan menggantikan pasir dengan POC seperti dalam JKR Standard.

ABSTRACT

The present research stems out from the environmental problem posed by dumping of palm oil clinker, a by-product of palm oil industry and excessive sand mining issues. Thus, experimental work has been conducted to investigate the effect of palm oil clinker content as partial sand replacement on the properties of brick. A total of three mixes containing various percentage of palm oil clinker, which are 7.5% 12.5% and 17.5% have been prepared. All specimens were water cured and air cured until the testing date. The compressive strength test, flexural strength test and water absorption test was conducted at 28 days, 60 days, and 90 days. The findings show that incorporation of 7.5 %, 12.5% and 17.5% palm oil clinker contribute towards densification of the mix which enhances compressive strength, flexural strength, density and water absorption rate test performance of the brick. The water absorption of the brick increases slightly when palm oil clinker is integrated as partial sand replacement. On overall, a good quality of brick can be produced by replacing sand with POC as in JKR Standard.

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LIST OF SYMBOLS

N/mm^2	Newton per millimetre square
kg/m^3	Kilogram per metre cube
%	Percentages
mm	millimetres

LIST OF ABBREVIATIONS

POC	Palm Oil Clinker
JKR	Jabatan Kerja Raya
W	Water Absorption
PWD	Public Work Department
MS	Malaysian Standard

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Sand is one of the principle materials used to create a sand brick. For the most part, the common sand creates from the mining movement has been utilized in the sand brick since years prior. The crude sand and rock created in Malaysia are expanding from year 2014 which is around 34,341,300 tons to 29,862,000 tons on 2015 individually (Malaysianminerals.com, 2016). This augmentation demonstrates that the interest of sand is very high and also the mining exercises likewise expanding. Despite the fact that the mining action gives a positive effect particularly in term of economic development in Malaysia, in any case, it additionally adds to the genuine ecological issues issue. The stream mining brought about channel debasement and disintegration, head cutting, expanded turbidity, stream bank disintegration and sedimentation of riffle regions (Kondolf, 1993). In addition, the mining action contaminates the waterway which is the fundamental wellspring of the crisp water and furthermore impacts the sea-going life. Sand mining movement affecting stream's biological community as well as can make deforestation with the end goal of the street development mining region. This issue can be decreased by limiting the utilization of normal sand in the development industry, which in the present work is sand brick.

Malaysia is one of the world biggest palm oil maker which creates a lot of by items that arranged as waste. Malaysia produces around 3.13 million tons of oil palm shell as waste, which assessed to develop because of the progressing worldwide utilization interest for palm oil (Basri et al., 1999). Palm oil clinker is one of the palms oil waste by item which regularly disposed of as profitless waste. Palm oil clinker is delivered from the cremation procedure of oil palm shells and fiber. This side-effect is dump at the landfill with no use and assessed around 2.6 million tons of strong waste was delivered every year by the palm oil industry which generally made out of palm oil clinker

and palm oil shell (Basri et al., 1999). Many researches have been led by using the palm oil by item to deliver another development material that can be utilized to supplant or incompletely supplant the characteristic assets. Palm oil clinker can be named an artificial aggregate due its properties which are like the natural aggregates.

1.2 Problem Statement

Nowadays people starting to construct green buildings, a green building come from usage materials. One of green building materials is a brick. The basic brick that we have in construction is a sand brick and clay brick but to improve the brick which is by turning the brick into green bricks, we can add natural waste material from agricultural. Green brick is an environmentally friendly which not ruin to environment or surroundings. There are a lot of waste in Malaysia, one of them is clinker. Around 2.6 million tons of solid waste was produced annually by the palm oil industry which mostly composed of POC and palm oil shell (Basri et al., 1999).

Reducing the quantity of normal sand utilized is likewise one of the approaches to protect the earth since common sand is getting close stream and it is not renewable material. Abuse of natural sand from waterway can causes waterway channel debasement and disintegration, head cutting, expanded turbidity, stream bank disintegration and sedimentation of riffle regions (Kondolf, 1993). Consequently, consider on uses of palm oil clinker (POC) as an elective sand in brick industry with a perspective of powerful use of the assets and natural insurance is important. With the end goal to look at the adequacy of POC as an incomplete sand substitution in cement sand brick and its relevance, few lab testings were directed and the outcome will be contrast and plain cement sand brick.

1.3 Objective of Study

The objectives of this study are:

i. To investigate the optimum ratio of palm oil clinker in cement sand brick.

ii. To determine the characteristic of cement sand brick in term of density, water absorption rate, compressive strength, flexural strength

1.4 Scope of Research

In this research palm oil clinker (POC) are used as the waste materials. Based on the objective of this research is to study the optimum percentages of palm oil clinker used in the cement sand brick. The dimensions of the brick are according to the Public Work Department (PWD) Standard Specification for Buildings Works, 2005, it stated that, all cement sand brick shall comply with MS 27. The nominal size of cement sand brick is, the length is 225 mm (± 3.2), width is 113mm (± 1.6) and depth is 75mm ± (1.6). The ratio used for the brick mixture is 1 ratio 6 (1:6) which are according to cement sand brick ratio.

In this research there are the percent of replacement for fine aggregate with ratio of 7.5% 12.5% and 17.5%. This ratio used to determine which the best ratio is there have 70 samples. Each ratio will undergo a testing and results analysis, and based on the testing and analysis result, the best optimum percentages of palm oil clinker are determined.
The laboratory testing is for properties at 28 days, 60 days, and 90 days. For compressive strength and flexural strength test were conducted at 28 days, 60 days, and 90 days. Water absorption and density test were conducted at 28 days. All this test was conducted in according to ASTM C67.

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