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 of Civil Engineering.

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THE EFFECT OF SBE ON THE PROPERTIES OF CEMENT SAND BRICK

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A report submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Civil Engineering

Faculty of Civil Engineering and Earth Resources
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JANUARY 2017

STUDENT'S DECLARATION

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

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DEDICATION

Praises be to Allah, the Lord and Sustainer of All the Worlds

All glory be to Him.

To my beloved families,

To my fellow friends and educators.

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LIST OF ABBREVIATIONS

SBE	Spent bleaching earth
MPOB	Malaysian palm oil board
NGO	Non-governmental organization
wt%	Weight percentage
SC	Scandium
CO_2	Carbon dioxide
FFA	Free fatty acid
Fe	Iron
Cu	Copper
OPC	Ordinary Portland Cement

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ABSTRACT

Cement sand brick is a type of brick made from a mixture of cement and sand. The characteristics of sand are the main reason why it is in great demand in the construction industry. On the other hand, spent bleaching earth (SBE) is a solid waste from industrial sector mainly generated from the edible oil processing that is usually dumped at landfill. Surprisingly, the characteristics of both materials which are sand and SBE are almost identical. By replacing sand with SBE, sand mining and waste disposal problems can be reduced as well as economical cement sand brick can be produced. This study aims to investigate the effect of SBE as partial sand replacement on the properties of cement sand brick. The field of studies also covers important parameters including compressive strength, flexural strength, and water absorption in determining the engineering properties. The compressive, flexural and water absorption tests for these required parameters will be conducted on 7 and 28 days after the cement sand bricks undergo water curing. This study found that the samples with 20% SBE exhibited higher value of compressive and flexural strengths with the lowest moisture absorption compared to other samples.

ABSTRAK

Bata simen adalah sejenis bata yang dihasilkan dari campuran pasir dan simen. Karakteristik pasir adalah penyebab utama pasir mendapat permintaan yang tinggi dalam industri pembinaan. Sebaliknya, SBE adalah bahan buangan pejal dari sektor industri yang dihasilkan melalui pemprosesan minyak masak mentah yang selalunya dibuang ke tapak pelupusan. Karakteristik pasir dan SBE adalah hampir sama. Oleh itu, dengan menggantikan pasir dengan SBE, masalah pelupusan SBE dan masalah alam sekitar yang terjadi daripada pelombongan pasir dapat dikurangkan manakala bata simen yang ekonomik dapat dihasilkan. Kajian ini dijalankan untuk mengkaji kesan SBE sebagai pengganti sebahagian pasir dalam bata simen. Kajian ini juga merangkumi parameter-parameter penting seperti kekuatan mampatan, kekuatan lenturan dan penyerap kelembapan untuk menentukan ciri-ciri kejuruteraan bata simen. Pemeriksaan mampatan, lenturan dan peratusan penyerapan air terhadap bata yang merangkumi parameter-parameter tersebut akan dijalankan pada hari ke 7 dan 28 selepas bata simen melalui pengawetan air. Kajian mendapati sampel yang mengandungi 20% SBE mempunyai kekuatan mampatan dan lenturan yang lebih tinggi, manakala peratusan penyerapan air pula yang terendah berbanding sample yang lain.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, the use of natural resources severely affects the surrounding environment. Numerous publications have been written with respect to this, and the next step is the reduction, prevention or correction of these environmental effects, the so-called mitigating measures (Pielou, 1966). As the societies worldwide grow more aware of the necessity of having a clean environment, the blame of making the planet dirtier fell solely on the construction industry. The industry is facing a quite numbers of existing challenges including high labor, price of materials, inefficient and ineffective methods and practices. The previous said issues need to be solved effective immediately if the world still desires better structures for the future generations.

Cement sand brick is made up of a mixture of cement and sand. The materials for making the brick particularly sand is gathered and extracted via sand mining. Sand mining is the removal of sand from their natural configuration. Sand is used for all kinds of things especially for construction projects due to its. Sand mining is beneficial but too much of it can cause problems to the environment. Environmental problems occur when the rate of extraction of sand exceeds the rate at which natural processes generate these materials. The morphologies of the mining areas have demonstrated the impact of mining with the prowess to destroy the cycle of ecosystems. It should however, be recognized that the processes of prospecting, extracting, concentrating, refining and transporting minerals have great potential for disrupting the natural environment (Rabie et al., 1994).

In Malaysia, the Malaysian Environmental NGOs (MENGO) is stepping up efforts to reduce the pollution and save the environment. This can be achieved through recycling of waste materials. Recycled materials are becoming more popular as replacement or enhancing ingredients in construction industry due to higher public awareness regarding the ecological sustainability and environmental damage. For this particular study, the spent bleaching earth (SBE) which is a solid wastage from industrial sector has a big potential to replace the usage of sand in making cement sand brick due to its high physical strength and almost similar in characteristic with the sand.

1.2 PROBLEM STATEMENT

The construction industry deals with a tremendous amount of problems, of which determine its productivity and being eco-friendly. As the years passed by, the environment needs to put a factor of any design to ensure the availability of earth natural resources and the sustainability of methods for construction. This study can offer many advantages which enable less usage of landfill for the using the waste material in the design of construction's material and less usage of sand to save the environment. During the year 2010, Malaysia consumed 2.76 billion metric tons of natural aggregate worth $14.4 billion. Of this amount 1.17 billion metric tons, or 42.4%, was sand and gravel, with a value of $5.7 billion. The percentage of total aggregate production that is sand and gravel varies widely from state to state. Melaka consumes 7.7% sand and gravel, which is lower than any other state. Selangor, Johor, Terengganu and Federal territory (Kuala Lumpur and Putrajaya) all consume 100% sand and gravel. About half of the aggregate (including crushed stone as well as sand and gravel) is used in government-funded projects. This pattern of material demand can't be fully met as time increases because the materials are non-renewable. On the other hand, Spent bleaching earth (SBE) is an extraction of residual oil from palm oil refining industry. The large quantity of SBE is disposed to landfills, causing fire and pollution hazards due to the substantial oil content in the earth. By using the material as a partial replacement of sand in cement sand brick, the usage of sand will be decreased while waste can be put to good use.

1.3 OBJECTIVES

The main objective of this research investigation was to study the effect of SBE on properties of cement sand brick. Towards achieving the above mentioned aim, the related objectives were identified as follows:

1) To determine the compressive strength of cement sand brick with SBE as partial sand replacement.
2) To determine the flexural strength of cement sand brick with SBE as partial sand replacement.
3) To determine the effect of SBE as partial sand replacement on the water absorption of cement sand brick.

1.4 SCOPE OF WORK

This study aimed to investigate the compressive and flexural strength of cement sand brick with spent bleaching earth (SBE) as a replacement of sand. The selected materials for this project are SBE, cement, water and mold. The flexural test was used to determine the strength of cement sand brick at 7 and 28 days. Based on the results obtained, the best percentage of SBE replacement was tested on brick added with 20% of SBE. Plain cement sand brick with 0% of SBE was used as control. The cement sand bricks that needed to be mixed with SBE were set to the following six proportions: 0%, 10%, 20%, 30%, 40%, and 50%. Water curing was conducted at two different durations (7^{th} and 28^{th} day) after the specimens were mixed. Compressive, flexural and water absorption tests were conducted after the curing period. Total specimens used for this research were 108 bricks.

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