

UNIVERSITI TEKNOLOGI MARA

**UTILISATION OF NON-METALLIC
MINERAL WASTES FOR
ECO-FRIENDLY BRICKS**

MUHAMMAD REDZWAN

BIN MOHAMAD RAFFE

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ABSTRACT

One of the industry that shows rapid growth in production output due to Economy Transformation Program (ETP) is tiles manufacturing industries. As the production tiles manufacturing industries continue to grow, the amount of waste and by-product generated from the manufacturing process also increased. The waste and by-product generated from the manufacturing process must be disposed in an environmentally sound manner and any failure will create nuisance and major problem to the environment. The main objective of this study is to investigate the potential use of ceramic dust (CD) and marble dust (MD) (wastes and by-product generated from ceramic and marble tile industry) in term of its engineering performances. Laboratory trials involving compacted cylindrical specimens of 50mm Ø and 100mm height were carried up to identify the optimum mixture composition prior to brick fabrication. CD and MD on its own or combination with siliceous material known as laterite soil (LS) were stabilised with Portland cement (PC) and hydrated lime (HL) on its own or combination with a by-product from steel industry, ground granulated blast furnace slag (GGBS). The compacted cylindrical specimens were fabricated at 10% and 20% dosage of stabilisers concentration and air cured for 7, 28 and 60 days before being tested for compressive strength and water absorption. In order to meet the industrial specifications, only cylindrical specimens which passed compressive strength value of 25,000 kN/m² were selected to be fabricated to ensure the bricks produced will achieve higher compressive strength values or meet the minimum requirement of compressive strength for common brick. The brick specimens sizes of 215mm x 102.5mm x 65mm were fabricated at Majpadu Bricks Sdn. Bhd, Malaysia. Series of engineering performance tests were carried out to examine the compressive strength, rate of water absorption, degree of efflorescence and thermal conductivity of brick specimens. The results clearly demonstrate promising engineering performance within the acceptable engineering standards for clay masonry units. Hence, suggests that CD and MD has a bright potential to be utilised as alternative renewable raw material for unfired brick which will promoting technological and environmental advantage of using non-metallic mineral wastes from ceramic and marble industry.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The total population of Malaysia as last reported was 28.5 million. It increases 250% in the last 50 years and continues to grow at a rate of 2.4% per year. As the numbers of population continue to grow, the demand for infrastructures is expected to increase due to accommodate and facilitate the ever expanding population. According to Naidu (2008), the Malaysian government is to expand infrastructure facilities to facilitate the growing demand arising from the growth and transformation of the economy. The policy aims to take Malaysia as a high-income nation with annual gross domestic product (GDP) growth of at least 6% with several high profile projects such as the Klang Valley Mass Rapid Transit system, Light Rail Transit extensions, Petronas Rapid complex, Kuala Lumpur River of Life and the major Iskandar development region in Johor. The construction sector is set for strong growth spurred by the Economic Transformation Program (ETP) (The Performance Management and Delivery Unit [PEMANDU], 2013). Thus, ensuring minimal infrastructure shortages is a top aim of the government in order to drive Malaysia economy forward.

The majority of the existing infrastructure has a great impact on environment and some of the facilities involved are not sustainable. Infrastructure development consumes large quantities of raw natural resources and generates large quantities of waste. The extraction, processing and transportation of these materials are significant sources of greenhouse gas emission and damage the environment. Therefore, there is an urgent need to improve strategic in the provision of infrastructure development. One way is to change behaviour in such that most development activities become sustainable, by adopting “Green Growth” strategy as stated in Malaysia National Agenda. This is an approach of pursuing economic growth necessary for enhancing quality of life, simultaneously minimising pressure on the environment’s limited carrying capacity. This could be achieved through the concept of eco-efficiency which is “doing more for less”, thus producing less waste in the process.