

UNIVERSITI TEKNOLOGI MARA

**PRESSURE RELIANCE ON MIX
COMPOSITION AND
REPLACEMENT LEVEL OF
EXPANDED POLYSTYRENE (EPS)
IN DRY MIX MORTAR**

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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Dry Mix Mortar



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ABSTRACT

In recent decades, the approach of using dry mix mortar in the construction industry is crucial due to high demand of concrete block for building materials either for load bearing or non-load bearing structure. Dry mix is widely used by manufacturers as it can be produced quickly and higher production because it's casted by machine. River sand is one of the natural resources used to produce building materials which is now depleting. Besides that, the consumption of polystyrene has extremely increased due to its many applications such as packaging purpose and consumer goods thus generated to the increment of polystyrene waste. Hence, the introduction of lightweight dry mix mortar incorporating with EPS executed with appropriate pressure is one of feasible options to overcome the issue. The objective of this study is to determine the best replacement of expanded polystyrene (EPS) powder in the design mix composition ratio of 1:3.0, 1:3.5 and 1:4.0, cement to sand with pressure of 500, 600 and 700 psi in achieving the targeted density between range of 1200 to 1800 kg/m³ and compressive strength between range of 5 to 7 N/mm² that suit it as lightweight and for non-load bearing purposes. The pressure was applied to compress the fresh mortar in the mould in order to produce a preform dry mix mortar cube size 100 mm x 100 mm x 100 mm. The EPS was mixed with different percentages of 35%, 40%, 45%, 50% and 55% as partial replacement of sand and 0% as control. A constant water cement ratio of 0.37 was used throughout the study and exposure to air-drying for a period of 7 and 28 days were considered in this study. The density and compressive strength tests were conducted to obtain the best replacement of EPS in dry mix mortar which achieve the targeted value. It is shows that 55% of EPS replacement in mix composition of 1:3.0, 1:3.5 and 1:4.0 at all pressures can be consider as appropriate mix proportion at 28 days of age. The density for all specimens also was found to be below than 1800 kg/m³, where it can be considered as lightweight concrete. However, the most appropriate mix was selected at 55% of EPS in mix design 1:3.5 subjected to pressure 500, 600 and 700 psi where compressive strength marked 5.010 N/mm², 5.045 N/mm² and 5.994 N/mm² respectively. Scanning Electron Microscopy (SEM) also was carried out in determining the morphological of the EPS dry mix mortar based on mix 1:3.5 at three (3) pressures. From the study, it can be suggested that the properties of EPS and pressure exerted play a crucial role to the density, thus influences the strength of mortar cube. Further study can be conducted by using mix 1:3.5 with higher level of EPS replacement to achieve higher compressive strength within the range of non-load bearing structure but lower in density.

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