

THE DEVELOPMENT OF LIGHTWEIGHT EXPANDED POLYSTYRENE CONCRETE BLOCKS

by

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APPROVAL AND DECLARATION SHEET

This project report titled “The Development of Lightweight Expanded Polystyrene Concrete Blocks” was prepared and submitted by Tey Lee Huan (Matrix Number: 091201454) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (RK- 82 Building Engineering) in University Malaysia Perlis (UniMAP).

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PEMBANGUNAN KONKRIT BLOK RINGAN DENGAN MENGGUNAKAN POLISTERINA

ABSTRAK

Perkembangan konkrit ringan telah diperkenalkan untuk digunakan dalam pembinaan. Ini adalah kerana konkrit ringan memainkan peranan yang penting dalam merendahkan kepadatan jika dibandingkan dengan konkrit biasa. Objektif kajian ini adalah untuk memperkenalkan bahan yang lebih ringan untuk pembinaan dan mengurangkan beban mati struktur. Bahan-bahan seperti polistirena dan debu kuari telah digunakan dalam kajian. Ciri-ciri polystyrene adalah mengurangkan ketumpatan konkrit manakala debu kuari telah digunakan sebagai sebahagian penggantian pasir untuk mengisi kekosongan dan melicinkan permukaan konkrit. Sebelum memulakan penyelidikan, pelbagai nisbah pemancuhan konkrit dikemukakan untuk menyiasat sifat-sifat konkrit ringan. Kemudian, kaedah dan ujian akan dijalankan seperti ujian kemerosotan, analisis ketumpatan, penyerapan air dan ujian mampatan. Dalam kajian ini, terdapat tujuh sampel telah dicipta dan sampel A telah digunakan sebagai sampel kawalan yang tiada polistirena; manakala nisbah optimum konkrit ringan adalah sampel F dengan kepadatan rendah dan tinggi dalam kekuatan mampatan. Sampel F telah mencapai 10.135 MPa dalam ujian mampatan, 1300 kg/m³ ketumpatan pukal dan 9.765% penyerapan air. Walaupun kekuatan sampel F adalah 44% lebih rendah daripada sampel kawalan, tetapi kepadatan sampel F adalah 36% lebih ringan daripada sampel kawalan. Kesimpulannya, terdapat empat sampel telah sepenuhnya mencapai matlamat iaitu ketumpatan lebih rendah daripada 1800 kg/m³ dan kekuatan mampatan adalah lebih tinggi daripada 5 MPa.

ABSTRACT

Nowadays, a new development of lightweight concrete has been introduced to use in construction. This is because lightweight concrete present an essential decrease in density if compared with normal concrete. The objective of this research is to create a lighter material for construction, decrease the dead loading for structural. Materials like polystyrene and quarry dust was used in studies. The characteristic of polystyrene is reducing the density of concrete while quarry dust was used as partially replacement for sand to refill the void and smoother the surface of concrete. Before start the research, proportional design is created to investigate the properties of lightweight concrete. Then, methodology is planned and several tests will move on like slump test, density analysis, water absorption and compression test. In this research, there seven samples was created and sample A was used as control sample which are absent of polystyrene; whereas, the optimum ratio of lightweight concrete is sample F with low density and high in compression strength. Sample F was achieved 10.135 MPa in compression test, 1300 kg/m³ in dry density and 9.765 % in water absorption. Although the strength of sample F is 44 % lower than control sample, but sample F is 36 % lighter than control sample. As a conclusion, there are four samples was fully achieve the objective which the density is lower than 1800 kg/m³ and the compression strength are higher 5 MPa.

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LIST OF ABBREVIATIONS

EPS	-	Expanded Polystyrene Bead
OPC	-	Ordinary Portland Cement
C-S-H	-	Calcium Silicate Hydrates
XRF	-	X-Ray Fluorescence
BS	-	British Standard
ASTM	-	American Society for Testing and Materials
CIDB	-	Construction Industry Development Board Malaysia
S.I	-	The International System of Units
RM	-	Ringgit Malaysia
w/c	-	Water – Cement Ratio
kg	-	Kilogram
MPa	-	Mega Pascal
mm	-	Millimeter
m ³	-	Meter Cubic
°C	-	Celsius
%	-	Percentage