

**STRENGTHENING OF RC BEAMS WITH
BAMBOO FIBER REINFORCED COMPOSITE-
POLYESTER PLATE**

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**B. ENG (HONS.) CIVIL ENGINEERING
UNIVERSITI MALAYSIA PAHANG**

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COMPOSITE- POLYESTER PLATE

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Thesis submitted in fulfilment of the requirements for the award of the degree of
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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 B. Eng. (Hons.) Civil Engineering.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis 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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DEDICATION

To my beloved parents,
Lee Chon Meng and Tan Kim Hong for their endless love and support,
and not to forget my beloved siblings,
Lee Sin Wei, Lee Sin Tien and Lee Khoo Sam.

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LIST OF SYMBOLS

m	Metre
mm	Millimetre
mm ²	Square millimetre
cm ⁻¹	Per Centimetre
%	Percent
kg	Kilogram
kN	Kilo newton
Mg	Megagram
MJ	Megajoule
MPa	Megapascal
GPa	Gegapascal
wt. %	Percentage by weight
vol. %	Percentage by volume
h	Height
g/cm ³	Gram per cubic centimetre
N/mm ²	Newton per square millimetre
° C	Degree Celcius
rpm	Revolutions per minute

LIST OF ABBREVIATIONS

RC	Reinforced Concrete
FRP	Fiber Polymer
BFRC	Bamboo Fiber Reinforced Concrete
CFRP	Carbon Fiber Reinforced Polymer
ASTM	American Society for Testing and Materials
FTIR	Fourier Transform Infrared Spectroscopy
TGA	Thermogravimetric Analysis
BS	British Standard
BS EN	British Standard Norme Européenne
CB	Control Beam
UBF	Un-strengthened Beam in Flexure
PSBF	Polyester Strengthened Beam in Flexure
UBO	Un-strengthened Openings Beam
PSBO	Polyester Strengthened Openings Beam