

MECHANICAL PROPERTIES OF CONCRETE
CONTAINING GROUND PALM OIL FUEL
ASH (POFA) AS PARTIAL SAND
REPLACEMENT

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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 Bachelor of Engineering (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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LIST OF SYMBOLS

$^{\circ}\text{C}$	Degree Celcius
$^{\circ}$	Degree
%	Percentage
μm	Micro meter
mm	Millimetre
m^3	Cubic metre
g	Gram
kg	Kilogram
kg/m^3	Kilogram per cubic metre
kN	Kilo Newton
MPa	Mega Pascal
f_c	Compressive strength of concrete specimen
P	Maximum load carried by the specimen during testing
A	Area
R	Modulus of Rupture
l	Distance between the support
b	Net Width
d	Depth

LIST OF ABBREVIATIONS

POFA	Palm Oil Fuel Ash
C-S-H	Calcium Silicate Hydrate
EFB	Empty Fruit Bunches
FFB	Fresh Fruit Bunches
CPO	Crude Palm Oil
OPS	Oil Palm Shell
CP	Coarse POFA
FP	Fine POFA
OPC	Ordinary Portland Cement
ASTM	American Society for Testing and Materials
BS	British Standard
Ca(OH) ₂	Calcium Hydroxide
SiO ₂	Silicon dioxide
Al ₂ O ₃	Aluminium oxide
Fe ₂ O ₃	Iron oxide
CaO	Calcium oxide
MgO	Magnesium oxide
Na ₂ O	Sodium oxide
K ₂ O	Potassium oxide
SO ₃	Sulfur trioxide
LOI	Loss on ignition