# STUDY OF SAND BRICK PROPERTIES WITH PARTIAL REPLACEMENT OF RICE HUSK AS SAND WITH RATIO 10%, 20%, 30%

# ADHAM AHMED MOHAMMED GABIR

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



### SUPERVISOR'S DECLARATION

I/We* hereby declare that I/We* have checked this thesis/project* and in my/our*
opinion, this thesis/project* is adequate in terms of scope and quality for the award of
the Bachelor Degree of Civil Engineering

\_\_\_\_\_

(Supervisor's Signature)

Full Name : PN. SHARIZA BINTI MAT ARIS

Position : LECTURER

Date :



#### 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.

(Student's Signature)

Full Name: ADHAM AHMED MOHAMMED GABIR

ID Number: AA13308

Date: 8 JANUARY 2018

# STUDY OF SAND BRICK PROPERTIES WITH PARTIAL REPLACEMENT OF RICE HUSK AS SAND WITH RATIO 10%, 20%, 30%

#### ADHAM AHMED MOHAMMED GABIR

Thesis submitted in fulfillment of the requirements

for the award of the

Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG

JANUARY 2018

#### **ACKNOWLEDGEMENT**

First of all, I am thankful to Almighty Allah, most Gracious, who in His infinite mercy has guided me to complete this Master research work. May Peace and blessings of Allah be upon His Prophet Muhammad (peace be upon him).

I am grateful to my supervisor PN. SHARIZA BINTI MAT ARIS for being an extraordinary supervisor who showed me the road and helped to get me started on the path to these degrees. Her enthusiasm, encouragement and faith in me throughout this research and have been extremely helpful. She was always available for my questions and she was positive and gave generously of her time and vast knowledge. She was always knowing where to look for the answers to obstacles while leading me to the right source, theory and perspective.

I would also like to express my sincere thanks to all the lecturers and laboratory staffs at the Structural and Material Laboratory of Civil Engineering and Earth Resources of Universiti Malaysia Pahang for their guidance, help, encouragement and support throughout my research programmed.

I am highly indebted to my parents, Ahmed Mohammed and Khazaran Mohammed for their continuous support that made every opportunity available to me throughout my life. I would also like to thank the member of reading committee for reviewing and evaluating my thesis. I am also thankful to my friends UMP colleagues for their useful knowledge, discussions, and always cheers me when I am grief.

Lastly, I would like to take this opportunity to thank my university, Universiti Malaysia Pahang for providing me the good condition of facilities and equipment to complete this study and thank you all to those people who have been involved in taking care of me during my Degree studies in Universiti Malaysia Pahang.

# TABLE Of CONTENT

DEC	CLARATIO	ON	
TITI	LE PAGE		
ACK	NOWLE	DGEMENTS	vi
ABS	TRAK		vii
ABS	ABSTRACT TABLE OF CONTENT		viii
TAB			ix
LIST OF TABLES		xii	
LIST	OF FIGU	URES	xiii
LIST	OF ABB	REVIATIONS	xiv
CHA	APTER 1 I	INTRODUCTION	1
1.1	Backgr	round Of Study	1
1.2	Proble	m Statement	3
1.3	Object	ive Of Study	4
1.4	Scope	Of Stud	4
1.5	SIGNI	FICANT OF STUDY	5
CHA	APTER 2	LITERATURE REVIEW	6
2.1	Introdu	ction	6
2.2	Bricks		7
	2.2.1	Brick Classification	7
	2.2.2	Brick Dimension	7
2.3	Green 1	Brick Concert	8
2.4	Tempo	rary Formwork	8
2.5	Materia	al	9
	2.5.1	Rice Husk (RC)	9
	2.5.2	Cement	10
	2.5.3	Fine Aggregates	12

	2.5.4	Water	12
2.6	Engineerin	g Properties Of Brick	13
	2.6.1	Compression Strength Test	13
	2.6.2	Flexural Strength Test	14
	2.6.3	Water Absorption of Brick	15
СНАР	TER 3 RES	SEARCH METHODOLOGY	16
3.1	Introduction	on	16
3.2	Laboratory	Work Methodololgy	16
3.3	Cement Sa	and Brick Design	18
3.4	Materi	al Used	19
	3.4.1	Ordinary Portland Cement (OPC)	19
	3.4.2	Rice Husk (RH)	19
	3.4.3	Fine Aggregates	20
	3.4.4	Water	21
	3.4.5	Plywood	21
3.5	Mix Pr	oportion	22
3.6	PREPA	RATION OF SAMPLE	22
3.7	CURIN	VG	25
3.8	TEST	PROGRAM	25
	_3.8.1	Determination of Density	25
	3.8.2	Water Absorption Rate	26
	3.8.3	Compressive Strength Test	27
	3.8.4	Flexural Strength Test	28
CHAP	TER 4 RES	SULT AND DISCUSSION	30
4.1	INTRODU	CTION	30
4.2	WATER A	ABSORPTION RATE	30
	421 Ca	omnarison of Water Absorption Rate of Brick	31

4.3	DENSITY	31
	4.3.1 Comparison of Density of Bricks	32
4.4	COMPRESSIVE STRENGTH TEST	33
	4.4.1 Compressive Strength of Water Curing	33
	4.4.2 Compressive Strength of Air Curing	35
4.5	FLEXURAL TEST	36
	4.5.1 Flexural Strength of Water Curing	36
	4.5.2 Flexural Strength of Air Curing	38
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS		40
5.1	INTRODUCTION	40
5.2	CONCLUSION	40
5.3	RECOMMENDATIONS	41
REFI	ERENCES	42
APPENDIX A APPENDIX B APPENDIX C		45
		48
		51
APPENDIX D		

# LIST OF TABLES

Table 2.1	General features of the five types of portland cement, (astm, 2005)	11
Table 3.1	Size of brick	18
Table 3.2	Sizes of standard cement brick	23
Table 3.3	Parameter of each testing	23
Table 4.1	Result of water absorption rate of brick	30
Table 4.2	Result of density rate of brick	32
Table 4.3	Compressive strength of water curing at 7th, 28th days in different	34
	percentages	
Table 4.4	Compressive strength of air curing at 7 <sup>th</sup> , 28 <sup>th</sup> days in different	35
	percentages	
Table 4.5	Flexural strength of water curing at 7th, 28th days in different	37
	percentages	
Table 4.6	Flexural strength of air curing at 7 <sup>th</sup> , 28 <sup>th</sup> days in different percentages	38

# LIST OF FIGURES

Figure 1.1 Chart Of Population Projection And Annual Population Growth Rate		1
	Malaysia Source: Department of Statistics, Malaysia	
Figure 1.2	Malaysia Milled Rice Area Harvested Annual Growth Rate,	3
Figure 2.1	Brick Surface, (Olsen Et Al,2001)	7
Figure 2.2	Rice Husks	10
Figure 2.3	Classification Of Bricks By Compressive Strength &	14
Figure 3.1	Flowchart Of Laboratory Work	17
Figure 3.2	Cement Sand Brick:	18
Figure 3.3	Rice Husks	20
Figure 3.4	Fine Aggregates	20
Figure 3.5	Plan View Of Brick Formwork	21
Figure 3.6	Side View Of Brick Formwork	22
Figure 3.7	Sequences Of Materials During Mixing	22
Figure 3.8	Curing Process	25
Figure 3.9	Compressive Strength Machine	28
Figure 3.10	3-Point Flexure Test	29
Figure 4.1	Water Absorption Rate Of Bricks	31
Figure 4.2	Comparison Of Density Of Bricks	32
Figure 4.3	Comparison Of Compressive Strength Of Water Curing For Different	34
	Percentages of Rh	
Figure 4.4	Comparison Of Compressive Strength Of Air Curing	35
Figure 4.5	Comparison Of Flexural Strength Of Water Curing	37
Figure 4.6	Comparison Of Flexural Strength Of Air Curing	39

#### LIST OF ABBREVIALTIONS

ASTM American Society for Testing and Materials

RH Rice Husks

IBS Industrial Building System

MS Malaysia Standard

OPC Ordinary Portland Cement
PWD Public Work Department

Department of Statistic, Malaysia

Ministry of Agriculture and Agro-based Industry, Malaysia