

**PHYSICAL AND MECHANICAL BEHAVIOUR OF POZZOLAN
MORTAR BLEND RICE HUSK ASH FILLED IN COLD-FORMED STEEL
STUB COLUMN**

WAN NURAIN SYAFIQAH BINTI WAN MOHD SUKRI

**Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Physics
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JANUARY 2020

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
CHAPTER 1 INTRODUCTION	
1.1 Background of study	1
1.2 Problem Statement	3
1.3 Significance of study	4
1.4 Objectives of study	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Introduction	6
2.2 Rice husk ash (RHA)	6
2.3 Silica (Si)	9
2.4 Hydrochloric acid used in pre-treatment	10
2.5 Mortar	11
2.6 Cold-formed steel stub column	12
2.7 Literature review	13
2.8 Critical remarks	18
CHAPTER 3 METHODOLOGY	
3.1 Introduction	21
3.2 Raw materials	21
3.3 Chemicals	22
3.4 Instruments and apparatus	23
3.5 Machine	23
3.6 Procedures	24
3.6.1 Preparation of Rice husk	24
3.6.2 Chemical treatment	24
3.6.3 Incineration	25
3.6.4 Characterizations of Rice husk ash	26
3.6.5 Cement preparation of mortar mixture	26
3.6.6 Moulding process	28
3.6.7 Curing process	29
3.6.8 Mortar testing	30

3.6.9 Preparation of built-up CFS stub column (250 mm of height)	30
3.6.10 Built-up CFS stub column testing	31

CHAPTER 4 RESULTS AND DISCUSSION

4.1 Introduction	33
4.2 Characterization of Silica	33
4.2.1 Surface morphology by SEM	34
4.2.2 Elemental characterization by used EDS	35
4.2.3 Analysing result by used XRD	39
4.3 Results of compression test for mortar	41
4.3.1 Mechanical properties of mortar	41
4.3.2 Water absorption of mortar cube	45
4.4 Results of compression test for CFS stub column	47

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion	49
5.2 Recommendations	51

CITED REFERENCES	52
-------------------------	----

APPENDICES	55
-------------------	----

<i>CURRICULUM VITAE</i>	59
--------------------------------	----

LIST OF TABLES

Table	Caption	Page
2.1	Summary of extraction of silica from RH and fabrication of the mortar	12
4.1	Silica contents for incinerated of un-leached and leached RH with different weight.	39
4.2	Max load (kN) and compressive strength (MPa) of mortar cube cured for 7 and 28 days using compression machine.	41
4.3	The water absorption of mortar cube cured for 7 and 28 days.	45
4.4	Comparison for the maximum load and compressive strength of CFS stub column	48
B.1	Comparison of the element in un-leached RH and acid leached RH	55
B.2	Result of mechanical testing for 0% RHA	56
B.3	Result of mechanical testing for 0.5% RHA	56
B.4	Result of mechanical testing for 1% RHA	56
B.5	Result of mechanical testing for 1.5% RHA	56
B.6	Result of mechanical testing for 2% RHA	57
B.7	Result of mechanical testing for 2.5% RHA	57
B.8	Calculation of water absorption for mortar cubes	57
B.9	Result of mechanical testing of CFS stub column	58

ABSTRACT

PHYSICAL AND MECHANICAL BEHAVIOUR OF POZZOLAN MORTAR BLEND RICE HUSK ASH FILLED IN COLD-FORMED STEEL STUB COLUMN

Nowadays, the number of underutilize of Rice husk (RH) increasing drastically as the rice production increasing in the world. Besides that, the use of cement in construction can cause a serious environmental condition and effect human health. In this research, the optimum percentage of silica in Rice husk ash (RHA) was filled into a mortar and CFS stub column. A study was conducted to determine the physical and chemical properties of RHA and to determine the mechanical properties of mortar and Cold-formed steel (CFS) stub column filled RHA. This research Preliminary leaching of RH with a solution of Hydrochloric acid (HCL) before incinerated at 550°C is to obtain relatively pure silica (>99%). The un-leached and leached RH were compared to observe the silica content in RHA. The incinerated 10 gram RH produce 34.58 percentage weight of silica. Amorphous silica (Si) particles were characterized by using Scanning Electron Microscope (SEM), Energy Dispersive X-Ray Spectroscopy (EDS) and X-Ray Diffraction (XRD). The morphological features of RHA displayed in SEM. The high silica content in RHA is determined in EDS and the amorphous peak was located at $2\theta = 23^\circ$ in the XRD pattern. The optimum percentage of RHA obtained will be filled into a mortar and CFS stub column. The compressive behaviour of mortar and CFS stub column were conducted by using a compression strength test machine. The RHA filled into a mortar and CFS stub column can increase its compressive strength by reducing cracking and buckling failure.