

**DURABILITY OF CONCRETE PRODUCED
FROM INTERNAL CURING CONCRETE
AGGREGATE MANUFACTURED FROM
INDUSTRIAL WASTE**

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

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DECLARATION

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ABSTRACT

Modern buildings have made extensive use of Internal Curing (IC) for high-performance concrete (HPC). Nowadays, the rise of industrial waste has numerous negative repercussions on both society and the environment. Also, the building industry has seen numerous risks on the riverbank as a result of the increased demand for sand. Consequently, these issues can be resolved and the ineffective external curing of high-performance concrete with a lower w/c ratio can be reduced by replacing the fine aggregate with internal curing concrete aggregate (ICCA) made from industrial waste. Here, ICCA has previously been created using various industrial wastes. This study intends to evaluate the mechanical properties and durability of ICC constructed using two types of ICCA generated from waste materials to partially replace fine aggregate. Tests by the broadly accepted methods of mechanical and durability evaluations, such as compressive strength, workability, static modulus of elasticity, surface resistivity, rapid chloride ion penetration, water permeability, saturated water absorption, and initial surface absorption were conducted for industrial mix design, and high-performance mix design. Three types of curing samples; internal curing, external curing, and non-curing, were evaluated. The effects on durability and mechanical properties of concrete with these ICCA aggregates as a replacement material for fine aggregate are reported. ICC showed a 10 to 20 percent increment in a slump, 5 to 15 percent increment in compressive strength, 9 to 12 percent reduction in static modulus of elasticity, and a 9 to 17 percent increment in surface resistivity compared to the conventional concrete. Moreover, it showed lower penetration of chloride ion permeability, and lower initial surface absorption at 28 days. Further, ICC showed a slightly higher depth of penetration and saturated absorption initially and a reduction with time.

Keywords - durability, internal curing aggregate, internal curing, fine aggregate, mechanical properties, industrial waste.

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TABLE OF CONTENTS

DECLARATION	3
ACKNOWLEDGEMENT	5
LIST OF ABBREVIATIONS.....	12
1. CHAPTER 01- INTRODUCTION	13
1.1 Background	13
1.2 Problem Statement	14
1.3 Objective	15
1.4 Scope and limitation of the research	15
1.5 The arrangement of thesis	15
2. CHAPTER 02 – LITERATURE REVIEW.....	16
2.1 General	16
2.2 High-Performance Concrete.....	16
2.3 Curing.....	18
2.4 Internal curing	19
2.5 Factors affecting the internal curing.....	21
2.6 Durability of internal curing aggregates.....	23
2.7 Raw Waste materials.....	23
2.7.1 Fly Ash.....	24
2.7.2 Reservoir Sediment Material (RSM)	24
2.7.3 Clay Calicut tile waste and Water Treatment Sludge	25
2.8 Durability tests	25
3. CHAPTER 03 – METHODOLOGY.....	29
3.1 General	29

3.2	PREPARATION OF ICCA.....	30
3.3	PREPARATION OF FLY ASH ICCA	30
3.4	PREPARATION TILE WASTE ICCA	32
3.5	PREPARATION OF CONCRETE SAMPLES	33
3.5.1	Materials	33
3.5.2	Mix Design.....	35
3.5.3	Amount of ICCA calculation	37
3.6	ACHIEVE SSD CONDITION OF ICCA	38
3.6.1	Procedure	38
3.7	SAMPLE CASTING.....	39
3.8	Curing of samples.....	42
3.9	Mechanical and Durability tests.....	45
3.9.1	Compressive strength.....	45
3.10	Workability.....	46
3.11	Static modulus of elasticity	47
3.12	Surface resistivity test (SR test)	49
3.13	Initial surface absorption test (ISAT).....	50
3.14	Water penetration test.....	51
3.15	Rapid Chloride ion penetration test.....	52
3.16	Saturated water absorption test	54
4.	CHAPTER 04 – EXPERIMENTAL RESULTS AND DISCUSSION.....	56
4.1	General	56
4.2	Workability.....	56
4.3	Compressive strength.....	57

4.4	Surface Resistivity.....	60
4.5	Rapid Chloride Permeability Test Results	61
4.6	Initial surface absorption test results	63
4.7	Water permeability test	66
4.8	Saturated water absorption test results	68
4.9	Statistic elastic modulus of elasticity test results	69
5.	CHAPTER 5- CONCLUSION AND RECOMMENDATION.....	71
5.1	Conclusion.....	71
5.2	Recommendations	72
	REFERENCES	73

LIST OF FIGURES

Figure 2-1: Shrinkage reduction strategies (Rodríguez et al., 2020).	18
Figure 2-2 Comparison of internal curing and external curing (Castro et al., 2010).....	21
Figure 2-3 Factors affecting the effectiveness of internal curing (Yang et al., 2020)	22
Figure 3-1 Propose methodology.....	29
Figure 3-2 Fly Ash and Reservoir Sediment Material	30
Figure 3-3 Prepare clay paste through the pugmill.....	31
Figure 3-4 Sintered and Sieved Fly Ash ICCA	32
Figure 3-5 Red clay Calicut Tile ICCA	33
Figure 3-6 Materials arrangement for concrete sample batching	40
Figure 3-7: casting of concrete samples.....	40
Figure 3-8: External curing concrete samples.	43
Figure 3-9: Internal curing samples.	44
Figure 3-10: Non-curing samples.	44
Figure 3-11: Compressive strength test.	46
Figure 3-12: Workability test.....	47
Figure 3-13: Static modulus of elasticity test.	48
Figure 3-14: Surface Resistivity test.....	49
Figure 3-15: saturated water absorption test.....	51
Figure 3-16: Water permeability test.....	52
Figure 3-17: Seasoning in RCPT test.....	53
Figure 3-18: Testing of RCPT samples.	54
Figure 3-19: Saturated water absorption test.	55
Figure 4-1 Slump values of industrial mix with CTW ICCA.....	56

Figure 4-2: Slump details of high-performance mix with FA ICCA.....	57
Figure 4-3 Comparison of industrial mix compressive strength values	58
Figure 4-4 Comparison of high-performance concrete mix compressive strength results	59
Figure 4-5 Comparison of SR test values of industrial mix.....	60
Figure 4-6 Comparison of SR test values of High-performance concrete.....	61
Figure 4-7 Comparison of RCPT results of industrial mix.....	62
Figure 4-8 Comparison of RCPT results of High-performance concrete mix.....	63
Figure 4-9 ISAT test results for industrial mix with CTW ICCA	64
Figure 4-10 Comparison of ISAT test results of high-performance mix with FA ICCA at 7 days.	65
Figure 4-11 Comparison of SWA test results of industrial mix CTW ICCA.....	68
Figure 4-12 Comparison of SWA test results of high-performance mix with FA ICCA.....	69
Figure 4-13 comparison of Statistic modulus of elasticity test results of High-performance mix	70

LIST OF TABLES

Table 2.1: Chloride ion penetration based on Surface Resistivity (AAHSTO T-358-15).....	26
Table 2.2 Water penetration test result details (Baweja, 1993)	26
Table 2.3 RCPT results indications ASTM C1202.....	28
Table 2.4 ISAT test results indication (Baweja, 1993).....	28
Table 3.1 Particle size distribution of used Fine aggregates.....	34
Table 3.2 Water absorption values of used fine aggregates.....	35
Table 3.3 Industrial mix design with CTW ICCA	36
Table 3.4 High-performance mix design with Fly Ash ICCA	36
Table 3.5: Concrete samples details for industrial mix design with CTW ICCA.	41
Table 3.6: Sample details of High-performance mix design.	42
Table 4.1: Depth of water penetration of industrial mix with CTW ICCA.	66
Table 4.2 Depth of penetration for high-performance mix with FA ICCA	67

LIST OF ABBREVIATIONS

ICCA - Internal Curing Concrete Aggregate

IC - Internal Curing

HPC - High-Performance Concrete

FA - Fly Ash

RSM - Reservoir Sediment Material

CCTW - Clay Calicut Tile Waste

WTS - Water Treatment Sludge

E - External Curing

N- Non-Curing

ISAT- Initial Surface Absorption test

RCPT- Rapid chloride-ion

SR- Surface Resistivity