

**SOME EXPERIMENTAL STUDIES
ON THE BEHAVIOUR OF PORTLAND CEMENT
AND CONCRETE IN SEA WATER**

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TO
MY PARENTS

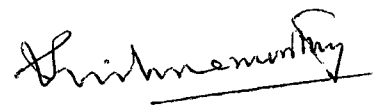
CERTIFICATE

This is to certify that thesis entitled "SOME EXPERIMENTAL STUDIES ON THE BEHAVIOUR OF PORTLAND CEMENT AND CONCRETE IN SEA WATER" being submitted by Mr Narendra Kumar Jain to the Indian Institute of Technology, New Delhi, India, for the award of the "DOCTOR OF PHILOSOPHY IN CIVIL ENGINEERING", is a record of bonafide research work carried out by him under our guidance and supervision.

To the best of our knowledge the thesis has reached the requisite standard. The material presented in this thesis has not been submitted in part or full to any other university or institution for award of a degree or diploma.



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ABSTRACT

In this experimental study, the behaviour of cement mortar and concrete on exposure to sea water and solutions of sodium chloride and magnesium sulphate have been examined, using three types of ordinary portland cements which had different compound compositions. Two of the cements were blended with flyash to the extent of 20% replacement of cement and were obtained from a thermal power plant.

The study includes the determination of changes in pore size distribution of dominant pore sizes, compressive and flexural strengths of the specimens, nondestructive parameters, such as ultrasonic pulse velocity, modulus of elasticity. X-ray diffraction, scanning electron microscopy and chemical analysis of selected samples were also studied.

The experimental studies are broadly grouped under two categories, namely, studies on standard mortar specimens and experiments on medium grade concrete.

The reagents used were of different concentrations. In some of them, the salt concentrations were of the same order as in sea water while in others, larger concentrations were used in order to obtain accelerating effects.

The principal conclusions which emerge from these studies are that the changes in dominant mean pore size can

explain to a significant extent the physical and chemical changes which take place in the hardened cement paste (hcp) of the various cements when attacked by solutions of sodium chloride, magnesium sulphate and sea water and that the addition of flyash improves the performance of mortar and concrete exposed to them.

LIST OF CONTENTS

CERTIFICATE	I
ACKNOWLEDGEMENT	II
ABSTRACT	IV
CONTENTS	VI
CONTENTS-PLATES	XII
CONTENTS-FIGURES	XIII
CONTENTS-TABLES	XXI
ABBREVIATIONS AND NOTATIONS	XXIV
CHAPTER 1	
INTRODUCTION	
1.1 General	1
1.2 Primary factors influencing durability of portlandcement concrete.	2
1.3 Influence of microstructure	3
1.4 Brief introduction to this work	3
1.5 What the subsequent chapters contain	4
CHAPTER 2	
A REVIEW OF LITERATURE	
2.1 General	6
2.2 Behaviour of cement paste/mortars/ concrete as influenced by chlorides	6
2.2.1 Postulated mechanisms	6
2.2.2 Mechanical properties	7
2.2.3 Influence of pore size alterations	9
2.2.4 X-ray diffraction studies	11

2.2.5	Diffusion of chlorides	12
2.2.6	Morphological studies	16
2.3	Behaviour of portland cement mortar/ concrete influenced by the magnesium sulphate	19
2.3.1	Postulated mechanisms	19
2.3.2	Mechanical properties	23
2.3.3	Criteria for failure	27
2.3.4	X-ray diffraction and morphological studies	27
2.4	Behaviour of portland cement mortar/ concrete influenced by sea water	29
2.4.1	Postulated mechanisms of attack	29
2.4.2	Mechanical properties	34
2.4.3	Permeability and porosity	37
2.4.4	X-ray diffraction studies	40
2.4.5	Penetration/diffusion of chlorides and sulphates	41
2.4.6	Morphological studies	45
2.5	Effect of pozzolanas	49
2.6	Mercury intrusion porosimetry (MIP)	52
2.6.1	Studies based on MIP	53
2.6.2	Mechanical strength and porosity	57

CHAPTER 3

STUDIES ON PORTLAND CEMENT MORTAR SPECIMENS

3.1	General	59
3.1.1	Materials, mix proportions and specimen sizes	60
3.1.2	Curing media and periods of observation	61
3.2	Behaviour of portland cement mortar in sodium chloride solutions	63

3.2.1	Compressive strength	63
3.2.2	Flexural strength	65
3.2.3	Mercury porosimetry measurements	66
3.2.4	X-ray diffraction analysis	73
3.2.5	Diffusion of chloride in mortars	76
3.2.6	Scanning electron microscopy studies	78
3.2.7	Discussion of the results	82
3.3	Behaviour of portland cement mortar specimens under magnesium sulphate solutions	86
3.3.1	Compressive strength	86
3.3.2	Flexural strength	88
3.3.3	Mercury porosimetry measurements	88
3.3.4	X-ray diffraction analysis	91
3.3.5	Diffusion of sulphates	93
3.3.6	Scanning electron microscopy studies	95
3.3.7	Discussion of the results	97
3.4	Behaviour of cement mortar specimens in sea water	101
3.4.1	Compressive strength	101
3.4.2	Flexural strength	102
3.4.3	Mercury porosimetry measurements	102
3.4.4	X-ray diffraction analysis	108
3.4.5	Chloride and sulphate diffusion	111
3.4.6	Scanning electron microscopy studies	114
3.5	Behaviour of portland cement mortar specimens in NaCl solution and then in MgSO ₄ solution and vice-versa	120
3.5.1	General	120
3.5.2	Compressive strength	120

3.5.3	Chemical analysis	125
3.5.4	X-ray diffraction analysis	128

CHAPTER 4

STUDIES ON PORTLAND CEMENT CONCRETE SPECIMENS

4.1	General	242
4.1.1	Materials, mix proportions and specimen sizes	243
4.2	Behaviour of cement concrete specimens under sodium chloride solutions	244
4.2.1	Compressive strength	244
4.2.2	Flexural strength	246
4.2.3	Ultrasonic pulse velocity, resonant frequency and dynamic modulus of elasticity	246
4.2.4	X-ray diffraction studies	249
4.2.5	Scanning electron microscopy studies	255
4.3	Behaviour of concrete specimens cured in magnesium sulphate solutions	260
4.3.1	Compressive strength	260
4.3.2	Flexural strength	261
4.3.3	Ultrasonic pulse velocity, resonant frequency and dynamic modulus of elasticity	262
4.3.4	X-ray diffraction analysis	265
4.3.5	Scanning electron microscopy	273
4.4	Behaviour of concrete specimens cured in sea water	273
4.4.1	Compressive strength	273
4.4.2	Flexural strength	274
4.4.3	Ultrasonic pulse velocity, resonant frequency and dynamic modulus of elasticity	275

4.4.4	X-ray diffraction studies	275
4.4.5	Scanning electron microscopy	285
CHAPTER 5		
DISCUSSION OF THE RESULTS		
5.1	Behaviour of portland cement mortar and concrete in NaCl solutions.	330
5.1.1	Compressive strength	330
5.1.2	Flexural strength	331
5.1.3	Mercury porosimetry measurements and X-ray diffractometry	332
5.1.4	Diffusion of chloride in mortars	334
5.1.5	Scanning electron microscopy	335
5.2	Behaviour of portland cement mortar and concrete in MgSO ₄ solutions	335
5.2.1	Compressive strength	335
5.2.2	Flexural strength	336
5.2.3	Mercury porosimetry measurements	336
5.2.4	Scanning electron microscopy and diffusion studies	336
5.3	Behaviour of portland cement mortar and concrete in sea water	337
5.3.1	Compressive strength	337
5.3.2	Flexural strength	338
5.3.3	Mercury porosimetry measurements	339
5.3.4	X-ray diffractometry and Electron microscopy	340
5.3.5	Chloride and sulphate diffusion	343
5.4	Behaviour of portland cement mortar in MgSO ₄ solution after curing in NaCl solution and vice-versa	343

CHAPTER 6

CONCLUSIONS

6.1	Part A - Confirmative conclusions	348
6.2	Part B - 'New' conclusions	356
6.3	Some suggestions for future studies	359
6.4	Practical implication of the findings	360

CHAPTER 7

APPENDIX

A	Details of earlier studies for sea water resistance of mortar/concrete	362
B	Morphology of cement hydrates	367
C	Details of cements used for study of mortars	370
D	Specimen calculation of porosity	371
E	Details of cements used for study of concrete	372
F	Reference	373