

CONCRETE ADMIXTURES

AND THEIR EFFECT ON CONCRETE PROPERTIES

by

Iakovou Androula

Project report

Submitted to

Department of Civil Engineering

of the Higher Technical Institute

Lefkosia-Cyprus

in partial fulfilment of the requirements

for the diploma of

TECHNICIAN ENGINEER

in

CIVIL ENGINEERING

JUNE 1999

HIGHER TECHNICAL INSTITUTE	PROJECT NO. 2926
----------------------------------	---------------------

## Summary

This project deals with different types of admixtures, which are placed in concrete in order to improve its properties bearing in mind the purpose for which the concrete will be used in every particular case.

The first chapter is a more general one and deals with the properties of plain concrete, concrete, which does not contain any admixtures.

The second chapter deals with the changes in the properties of concrete when water-reducing admixtures are incorporated in concrete and especially the water-reduction and the increase in workability.

In the third chapter the admixtures that are examined are the air-entrainers.

The fourth chapter deals with the retarding admixtures and more extensively on their effect of the retardation of concrete.

The fifth chapter refers to the changes in concrete properties when an accelerating admixture is incorporated in a concrete mix.

The sixth chapter deals with the uses of each admixture in different situations.

Chapter 7 describes the methods incorporated in the performance of the experiments.

## Contents

Acknowledgements

Summary

Introduction

1	Chapter 1: Properties of plain concrete.....	1
1.1	Fresh concrete.....	1
1.1.1	Workability.....	1
1.1.2	Segregation.....	1
1.1.3	Bleeding.....	2
1.2	Plastic concrete.....	2
1.2.1	Strength of concrete.....	2
1.2.1.1	Compressive strength.....	2
2	CHAPTER 2: Water-reducing admixtures.....	4
2.1	Introduction.....	4
2.2	The chemistry of the water-reducing admixtures.....	4
2.2.1	Lignosulphonates.....	5
2.2.2	Hydroxycarboxylic acids.....	6
2.2.3	Hydroxylated polymers.....	7
2.2.4	Salts of naphthalene formaldehyde sulphonic acids.....	7
2.2.5	Salts of melamine formaldehyde sulphonates.....	8
2.2.6	Effects of water-reducing admixtures on concrete.....	8
2.3	Effects of water reducing admixtures on the properties of plastic concrete.....	9
2.3.1	Stability of fresh concrete containing water-reducing admixtures.....	10
2.3.1.1	Cohesion.....	11
2.3.1.2	Bleeding.....	11
2.4	Mix design.....	12
2.5	Effects of water-reducing admixtures on the properties of hardened concrete...	13
2.5.1	Compressive strength.....	13
2.5.2	Permeability.....	13
2.5.3	Durability.....	14
2.6	Results and comments on experimental work.....	15
2.6.1	Plasticizers.....	15
2.6.2	Superplasticizers.....	19
2.6.3	Air-entrainers and retarders.....	20
3	CHAPTER 3: Air-entraining admixtures.....	22
3.1	Introduction.....	22
3.2	Composition and manufacture.....	23
3.2.1	Abietic and pimeric acid salts.....	23
3.2.2	Fatty acid salts.....	23
3.2.3	Alkyl-aryl sulphonates.....	23

3.2.4	Alkyl sulphates.....	24
3.2.5	Phenol ethoxylate.....	24
3.3	Use in concrete.....	24
3.4	Effects of air-entrainment on plastic concrete.....	25
3.4.1	Mechanism of air-entrainment.....	25
3.4.2	Stabilizing action of air-entraining agents.....	26
3.5	Effects of air-entraining agents on the properties of plastic concrete.....	26
3.5.1	Volume of entrained air.....	27
3.5.2	Workability.....	28
3.5.3	Mix stability.....	29
3.6	Effects of air-entraining agents on the properties of hardened concrete.....	29
4	CHAPTER 4: Retarding admixtures.....	31
4.1	Introduction.....	31
4.2	Effect of retarders on fresh and plastic concrete.....	33
4.2.1	Workability.....	33
4.2.2	Slump loss.....	33
4.2.3	Bleeding and segregation.....	34
4.2.4	Finishing characteristics.....	34
4.3	Disadvantages in the use of retarders.....	35
4.4	Compressive strength.....	35
5	CHAPTER 5: Accelerating admixtures.....	38
5.1	Introduction.....	38
5.2	The chemistry of accelerators.....	38
5.3	The effects of accelerators on the properties of plastic concrete.....	39
5.4	The effects of accelerators on the properties of hardened concrete.....	39
5.4.1	Compressive strength.....	39
5.4.2	Durability.....	40
6	CHAPTER 6: Applications of admixtures.....	43
6.1	Introduction.....	43
6.2	Applications.....	44
7	CHAPTER 7: Experimental work.....	51
7.1	Introduction.....	51
7.2	Workability.....	51
7.2.1	Slump test.....	51
7.3	Compressive test of moulded cubes.....	56
7.3.1	Making and curing test in the laboratory.....	56
7.3.2	Compressive strength of moulded cubes:.....	59
	Conclusions	
	References	