

TO STUDY THE INFLUENCE OF PARTIAL REPLACEMENT OF
ORDINARY PORTLAND CEMENT BY SILICA FUME IN HIGH
STRENGTH CONCRETE WITH RESPECT TO ITS RESISTANCE
TO CHLORIDE INGRESS

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TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENT	
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	iv
ABSTRACT	v
CHAPTER ONE : INTRODUCTION	
1.1 General	1
1.2 Definition of High Strength Concrete	3
1.3 What is Silica Fume	3
1.4 Field of study	4
1.5 Objectives of study	6
CHAPTER TWO : THEORY	
2.1 Portland cement	7
2.2 Chemical composition of Portland cement	7
2.3 Hydration of cement	8
2.4 Microsilica	9
2.5 Properties of Densified Microsilica concrete	11
2.6 Process of chloride ingress into concrete	15

ABSTRACT

In recent years, Condensed Silica Fume (CSF) have been widely used for the construction of concrete structures in countries such as UK, USA, Japan and Europe for economical and ecological reasons, since CSF is the by-product of induction ore furnaces in silicon metal and ferrosilica alloy industries in these countries. Therefore, most research work on the use of CSF as partial replacement of Ordinary Portland Cement (OPC) has been carried out.

The important characteristics of concrete are its compressive strength and durability. Durability of concrete is the most important between these two factors, which indicates the long term strength of concrete. Durability is inversely proportional to permeability.

In this investigation, the influence of partial replacement of OPC by CSF in high strength concrete and the factors affecting durability are studied with respect to its resistance to chloride ingress based on diffusion of chloride ion.

The chloride diffusion test was carried out on 150-mm cubes at 30, 60, 90, 120 and 150 days after immersed in a container containing sodium chloride (NaCl) solution. The solution with Cl^- concentration assesses the high corrosion risk due to chloride ingress. These cubes were immersed in NaCl solution after curing in water for 28 days.

After a scheduled soaking period, the cubes were core in the cylinder shape and split into 2 portion. Then sprayed the sample with 0.1N AgNO_3 . The depth of Cl^- penetration χ , which is the distance from concrete surface to the colour change boundary, was then used as a measurement of Cl^- ingress.

Based on the study, the increase in dosage of replacement is directly proportional to the increase in resistance to chloride ingress without showing any optimum value. The performance of concrete ingress also depends on the period of concrete exposure.

CHAPTER ONE

INTRODUCTION

1.1 GENERAL

In recent years there has been considerable interest in improving the properties of concrete particularly the early age compressive strength development, especially in high strength concrete. Many methods have been used and these include the use of a superplasticizer to reduce the water content of a concrete mix or the combined use of a superplasticizer and pozzolanic materials such as fly ash or silica fume (microsilica).

In Malaysia, four types of pozzolanic materials are available, namely fly ash, slag, microsilica and rusk ash.

Interest has been shown by the Malaysian construction industry in using microsilica for the production of high strength concrete. An obvious example of the use of high strength microsilica concrete is in the construction of the Petronas Twin Towers at Kuala Lumpur City Center.

There are several advantages of incorporating microsilica to produce high strength concrete. But there are three most commonly specified requirements of concrete for construction.