

**TO STUDY THE PROPERTIES OF HIGH STRENGTH CONCRETE USING
ORDINARY PORTLAND CEMENT (OPC) WITH SILICA FUME
(MICROSILICA) BY REPLACEMENT METHOD IN TERMS OF
COMPRESSIVE STRENGTH AND ABSORPTION.**

**BY :
NOOR AZMAN BIN MASTOR**

**A report submitted to the Faculty of Civil Engineering in
Partial Fulfilment of the Requirements for the award of a
Degree in Bachelor of Engineering (Honours)(Civil).**

OCTOBER 1998

ACKNOWLEDGMENTS

I would like to express my appreciation to the **Mara Institute of Technology**, especially to the Faculty of Civil Engineering, that has contributed to the completion of this project.

I also would like to express my highest appreciation to my Project Supervisor, **Puan Che Maznah bt. Mat Isa** and Project Co-Supervisor, **Ir. Mohd Ali bin Jelani, PJK**, for their great interest, guidance and encouragement throughout the preparation of this project.

Thanks are also to **Mr. Kamaruddin b Othman**, technician of concrete laboratory and to the staffs of the Mega Pascal Sdn. Bhd especially to **Mr. Chan** for their cooperation and assistance in providing informations and microsilica for the purpose study.

Noor Azman Mastor

October 1998

CONTENTS	PAGE
-----------------	-------------

ACKNOWLEDGEMENT	i
TABLE OF CONTENT	ii
LIST OF TABLES	vi
LIST OF FIGURE	vii
ABSTRACT	viii

CHAPTER 1 : INTRODUCTION

1.1 General	1
1.1.1 Dosage of microsilica	3
1.1.2 Durability	3
1.1.3 Workability	4
1.2 Objective	4

CHAPTER 2 : THEORY

2.1 Introduction of Ordinary Portland Cement	6
2.1.1 Chemical composition of Portland Cement	6
2.1.2 Hydration of cement	8
2.2 Introduction of Silica Fume	9
2.2.1 Chemical composition of Silica Fume	10
2.2.2 Effect of pozzolans in Silica Fume	12

ABSTRACT

The use of high strength concrete (HSC) in structures is increasing worldwide and has begun to make an impact in Malaysia. In the past two semesters, the studies have been carried out on high strength concrete with the effect of silica fumes and the method of concrete mix used was **by addition**. The main purpose of study is to engage into high strength concrete with the effect of silica fume **by replacement method**. The influence on concrete under wet and hardened condition have also been observed.

The study has investigated the effects on behavior of microsilica concrete with variation of silica fume (microsilica) quantity. A grade 60 concrete was designed at varying quantity of silica fume, replaced from the absolute weight of cement used in mix design. For the strength development and permeability , the tests were carried out on 150mm cubes at ages 28 days and 60 days after the mixing. Types of testing performed were Slump test, Compressive strength test and Initial Surface Absorption Test (ISAT). The tests have shown the optimum percentages of silica fume that gave the best performance of high strength concrete.

The previous studies have proven that the effect of HSC **with addition** of silica fume has a significant improvement in performance in terms of durability and strength. From the current study it has been found that **with the replacement** of silica fume the improvement in performance is also significant as compared to the previous method. A thorough study on strength development and the permeability in terms of absorptivity of densified microsilica concrete has been carried out with specific objectives in finding out their workability, strength development, impermeability and durability.

The significant results achieved show that for strength development and durability the optimum dosage by replacement of microsilica for cement content of 15% and 16% has given the best performance respectively.

1.0. INTRODUCTION

1.1. General

These days concrete is being used for so many purposes in different conditions. In general, concrete possesses high compressive strength and stiffness with adequate durability under exposure to normal environmental conditions. There are characteristics that limits its wider use. Concrete inherently is brittle and weak in tension. With increase in trend towards the wider use of concrete for prestressed concrete, large span bridges and high-rise buildings, there is a growing demand for concrete of higher compressive strength than has been hitherto used traditionally.

The use of high strength concrete (HSC) in structures is increasing world wide and has begun to make an impact in Malaysia. A few years ago, a characteristic compressive strength of 40 Mpa would have been considered high, in Malaysia but now it was become normal phenomena. Nowadays, concrete with a 28 days curing and has a characteristic cube strength of 60 Mpa and above will be considered as a high strength