

**FINAL YEAR PROJECT REPORT  
BACHELOR OF ENGINEERING (HONS.) (CIVIL)  
SCHOOL OF CIVIL ENGINEERING  
MARA INSTITUTE OF TECHNOLOGY**

**COMPARATIVE INVESTIGATION OF THE  
UTILISATION OF MICROSILICA AND GGBS IN  
REDUCING THE CHLORIDE INGRESS IN  
CONCRETE**

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## ACKNOWLEDGMENTS

In the name of *ALLAH* the Almighty, The most beneficent and the most merciful, I would like to express my deepest sense of gratitude to Him that with Thou help and Guidance I have managed to complete this project paper.

I would like to take this opportunity to express my deepest feelings of gratitude and appreciation to *En. Ahmad Ruslan Mohd Ridzuan and Ir. Ali Jelani Lecturers*, School of Civil Engineering, MARA Institute of Technology, Shah Alam for their valuable guidance and dedication towards the accomplishment of this project and also to all my family for their support.

I would like to thank to *MEGA PASCA SDN. BHD* for providing the microsilica and reference on the material and also to *En. Fadzil Bin Ramli* for their thesis to make comparison with my project paper.

Lastly, I would like to thanks to my friends for support in completing my project paper and also to all the technicians in the Civil Engineering Laboratory (concrete division) for their assistance in carrying out all laboratory tests required by this project.

## ***ABSTRACT***

The compressive strength and durability are two most important characteristic of concrete. The strength development and durability of concrete can be measured and indicated by testing.

This project paper represents the results of research on the influence of partial replacements of OPC by microsilica and compared with GGBS for grade 20 N/mm<sup>2</sup> concrete with respect to the strength development and resistance to chloride ingress.

For the microsilica, the experimental programme comprised of five replacement levels namely 0%, 4%, 8%, 12% and 16% and for the GGBS are 0%, 40%, 60%, 75% and 90%. The 0% replacement is employed as control mix. The percentage replacements is based on optimum replacement of the material for the strength developments

The cube size for strength development are 100mm x 100mm and the test was carried at 3, 7, 28 and 90 days after curing in water. While the chloride diffusion test was done on a 100mm x 100mm x 500mm prism immersed in a container containing sodium chloride (Na Cl) solution concentration equivalent to that of seawater ( 19380 ppm Cl). To determine the depth of penetration, the prism were split in the transverse direction and droplets of 0.1 N silver nitrate (AgNO<sub>3</sub> ) solution was applied to the split surface. The

## **1.0 INTRODUCTION**

Good concrete does not only depend on a good designer or engineer. It depends on good materials, accurate batching, and the right mixing. It also depends on well-place reinforcement, well made formwork, careful compacting and good finishing.

Concrete has been used as a building material two thousand years. Its widely available, versatile and cost effective as compared with conventional structural materials. Concrete can be made on site into a range of shapes, sizes and given various finishes. The properties of concrete have made it an essential material in the construction industry.

The most important factor in the long time safety of concrete structure is concrete durability. The durability of concrete can not be separate from the durability of concrete structures. For the durability strength, homogeneity of concrete is very important. Systematic maintenance and protection are other important factors that significantly bear on concrete durability. While starting from the choice of a building site, suitable system of construction and ending with the proper design, durability of concrete must be complex basis (*Diah,1992*).

Microsilica is a recent arrival among cementitious materials. It was originally introduced as a pozzolan. However, its action in concrete is not only that of a very reactive pozzolan but is also beneficial in other respects. It can be added that microsilica is expensive. Microsilica is also referred to as silica fume or condensed silica fume, but the