

**FINAL YEAR PROJECT REPORT**  
**BACHELOR OF ENGINEERING ( HONS ) (CIVIL)**  
**SCHOOL OF CIVIL ENGINEERING**  
**MARA INSTITUTE OF TECHNOLOGY**  
**SHAH ALAM , SELANGOR D.E**



**ANALYSIS OF PARTIALLY PRESTRESSED CONCRETE**  
**RECTANGULAR WAFFLE SLABS SUBJECTED TO**  
**CYCLIC KNIFE EDGE LOADING ( KEL )**

**AHMAD ARIFIN BIN KASAH**

**NOVEMBER 1996**

## ACKNOWLEDGEMENT

In the name Of Allah , the most Beneficent , most merciful. With His permission , Alhamdulillah the study has completed. Praised to Prophet Muhammad , his companions and to those who is on the path as what he preached upon , may the Almighty Allah keep us in His blessing and tender care.

During preparation of this thesis , the author have had to draw upon the active help of a large number of persons to make this thesis a possible success. A very special thanks and reward to **Puan Afidah Abu Bakar** , Senior Lecturer of Structural and Computer Division cum thesis Supervisor for all the assistance , guidance and continuous advise throughout the preparation of this project paper. Also a high level of appreciation to Dr. Azmi Ibrahim , Project Co-ordinator , who had guided him to perform a meaningful study and presentable report writing.

I would also like to thank to Tuan Haji Jamil Abu Saari , CADEM System Manager and his staff, all Civil Engineering lecturers , librarians of Perpustakaan Tun Abdul Razak And NCUK , and lastly for the members of Class December 1996 for supplying the facilities , valuable information and guidance. Your co-operation and useful advice are very much appreciated.

# **TABLE OF CONTENTS**

**Acknowledgement**

**Table of Contents**

**List of Tables**

**List of Figures**

**List of Plates**

**Abstract**

## **CHAPTER 1**

### **INTRODUCTION**

|     |                      |   |
|-----|----------------------|---|
| 1.1 | Synopsis             | 1 |
| 1.2 | Statement of problem | 1 |
| 1.3 | Objective of study   | 1 |
| 1.4 | Scope of study       | 2 |

## **CHAPTER 2**

### **LITERATURE REVIEW**

|     |                      |   |
|-----|----------------------|---|
| 2.1 | Waffle Slab          | 6 |
| 2.2 | Partial Prestressing | 7 |

## ABSTRACT

This project is an attempt to study the behaviour of partially prestressed concrete rectangular waffle slabs of different sizes and number of waffles. With the aid of a computer program available in CADEM Centre at Institut Teknologi Mara (ITM) , in particular ANalysis SYStem ( ANSYS ) Version 5.0 , developed from finite element methods , the analysis can be done with respect to the purpose of this study.

Three specimens of partially prestressed rectangular waffle slab are modelled and analysed using the software. The specimens namely WR 01 , WR 02 and WR 03 are similar in the overall size but with different size , and number of waffles and ribs within them. The output will be compared to the results that had been obtained from previous laboratory testing . Results are examined in terms of load - deflection, stress - strain relationships and expected crack propagation.

## **1.0 INTRODUCTION**

### **1.1 Synopsis**

This paper is a continued study from earlier laboratory work done by Mohd Tarmizi Wahab<sup>(1)</sup> in 1991. The testing were conducted to determine the behaviour of Partially Prestressed Rectangular Waffle Slabs of 1.15 m by 2.20 m overall size with different sizes and number of waffles within them. All the specimens were tested under Cyclic Knife Edge Loads ( K.E.L ) acting along the shorter span with simple supports at two parallel edges.

### **1.2 Statement of problem**

From the structural aspects , the benefits of waffle slabs are that they are comparatively lightweight and produce small deflection where both properties are important in structures. Due to these , there is a need to study their effectiveness in term of reduction of the overall thickness and the use of partially prestressed construction method. In this paper , a approach to the analysis of waffle slab are presented and discussed.

### **1.3 Objective of study**

The purpose of this work is to make a comparison study on the behaviour of three different specimens of partially prestressed rectangular waffle slabs under Cyclic Knife