ANALYSIS OF REINFORCED CONCRETE BEAM USING STAAD-III RELEASE 22.3a

BY

SHAHARUDIN SHAH BIN ZAINI

A Report Submitted To The School Of Civil Engineering

MARA Institute Of Technology, Shah Alam

In Partial Fulfilment Of The Requirement For A Degree In

Bachelor Of Engineering (HONS) (CIVIL)

MARCH 1998

ABSTRACT

The finite element method is a numerical procedure for analysing structures and continua and originated as a method of stress analysis. Today finite elements are also used to analyse problem not only in structural but its application has extended to include problems of heat transfer, geotechnic, fluid flow, lubrication, electric and magnetic flows and many others.

In structural analysis, the application of forces to a structure produces stress and deformation. Stresses and deformation can be severe in magnitude, depending on the amount of loading applied, duration or number of repetition and may cause material failure.

This report is to analyse a simply supported reinforced concrete beam of high strength concrete (Grade 60). The analysis, done using finite element approach with the aid of STAAD-III Release 22.3a software, produced for estimating stresses and deflections of the beam and where ever possible, comparison with the experimental work will also be conducted [Rasul, 1996].

TABLE OF CONTENTS

CONTENT			PAGE
ACKNOWLEDGEMENT			i
TABLE OF CONTENTS			ii
LIST OF SYMBOLS			v
LIST OF FLOWCHARTS			vi
LIST OF FIGURES			vii
LIST OF PLATES			viii
ABSTRACT			x
CHAPTER 1	INTRODUCTION		1
	1.1	General	1
	1.2	Statement of Problems	2
	1.3	Scope of Analysis	3
	1.4	Objective of the Study	3
CHAPTER 2	LITERATURE REVIEW		5
	2.1	High Strength Concrete	5
	2.2	Stress	6
	2.3	Deflection	8
	2.4	Flexural Behaviour of Reinforced Concrete Member	9

2.4.1 Flexural Behaviour Under Static Loading 10

2.4.2 Flexural Behaviour Under Dynamic Loading 11

2.5 Finite Element Method 12

2.5.1 Brief Development History of Finite Element Method 12

2.5.2 Terminology 13

2.5.3 Element Types 14

2.5.3.1 Plane Stress Element 15

2.5.4 Steps in Finite Element Analysis 15

2.5.5 Process of Discretization 18

CHAPTER 3 STAAD-III Release 22.3a HIGHLIGHTS 20

3.1 Introduction to STAAD-III for Windows 20

3.2 Overview of Facilities 20

3.3 STAAD-III Analysis and Design 21

3.4 STAAD-PRE (Graphical Input Generation) 21

3.5 STAAD-POST (Graphical Post Processing) 22

3.6 Generating Input Data File 22

3.7 Processing Step From Input File to Output File 23

3.8 STAAD-III Finite Element Information 23

3.9 Theoretical Basis 24

3.10 Dynamic Analysis 26

3.10.1 Mass Modelling in Dynamic Analysis 26

3.10.2 Response Time History Analysis 27

3.11 STAAD-III Limitations 28

CHAPTER 4 DESIGN AND ANALYTICAL CONSIDERATION 30

4.1 Reinforced Concrete AND Loading Data 30

4.2 Elasticity calculation 31

4.3 Checking for Design Adequacy 32

4.4 Idealisation of Plane Stress Model 32

CHAPTER 5 RESULTS AND DISCUSSION 36

5.1 Static Analysis 36

5.2 Dynamic Analysis 38

5.3 STAAD-III Advantages 39

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS 43

REFERENCES 44

APPENDICES

Appendix A - Flowcharts 46

Appendix B - Plates 48