

HIGHER TECHNICAL INSTITUTE

CIVIL ENGINEERING DEPARTMENT

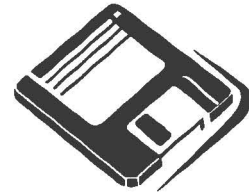
DIPLOMA PROJECT

ANALYSIS OF 2-D FRAMES USING
THE STIFFNESS METHOD

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Analysis of 2D Frames Using The Stiffness Method.

By

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To my family for their unlimited love and support.

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"She had a great sense of humor and a great sense of humor. I really understand the things we cannot really understand. It is with the forces we cannot really understand. It is with the forces we cannot really understand."

It's been a very long way for me to reach this stage, especially since being a foreign student. However, it would never have been possible for me to complete my objectives without the help of Dr. Christis Chrysostomou. His endless hints and suggestions are surely the basis of this project.

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SUMMARY

"Structural Engineering is the art of moulding materials we do not really understand into shapes we cannot really analyse, so as to withstand forces we cannot really assess, in such a way that the public doesn't really suspect"

--Structural Steel Design

Actually Structural Engineering is the science of estimating generated forces under different loading conditions. A part of this estimation requires in depth calculation of each element of structure and this calculations can be quite lengthy, especially in a multi-storey building. This is where a computer cuts in. A computer can actually go through all the calculations in matter of seconds. So it was a great challenge as a Structural Eng. student to program such a software to analyse 2-D FRAMES. Therefore the whole thesis of the project is to develop a Software to ANALYSE 2D FRAMES. It was also kept in mind during the development stages that the average user was quite unfamiliar with the software environment and needed to be guided through out the program and everything needed to be visual. Eventually Microsoft Visual Basic 4.0 was used to program the software. The advantages of the language is thoroughly discussed in the appropriate chapters. Finally a 'Fool-Prove Data-Entry' stage was developed, meaning that if any of the essential data were inputted wrong by mistake or were overlooked, then the program will display the appropriate message, prompting the user to input them correctly. Moreover, unlike other similar software, this one takes

advantage of the powerful windows DLL files as well as Dynamic Arrays, giving it the capability to input structures with unlimited members (Although in this case sufficient memory will be required). Finally the software generates the results with the capability to draw the Bending, Shearing and Thrust force diagrams for each member as well as showing all the relevant reactions and displacements. Printing capability was also integrated with the above form.

As for the method of analysis The Displacement Method (Direct Stiffness Method) was used, taking advantage of the Banded-Type matrix as well as less memory blockading possible through manipulation of the basic equations. A detail description of the development of this Equations are given in appropriate chapters. All in all, the final product incorporates the modern programming techniques and technology together with the ideas of the great Scholars of Structural Engineering, resulting in a tremendous saviour of time, a major boost to less effort and above all a more simple life for the Structural Engineer in this ever complex world.