HIGHER TECHNICAL INSTITUTE NICOSIA-CYPRUS CIVIL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

C/1054

COMPUTERIZED DESIGN OF AN INDUSTRIAL BUILDING

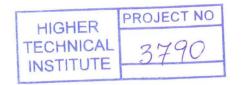
by:

Foading Nono Isaac Raoul

Supervisor:

Dr. Chrisis Papaleontiou

June 2009



CHAPTER 1: INTRODUCTION

1.1 GENERAL:

The aim of structural design is to provide, with due regard to economy, a structure capable of fulfilling its intended function and sustaining the specified loads for its intended life.

This can be done by hand calculation or with structural engineering software such as STAADPro.

STAADPro is structural engineering software for 3D model generation, and it is a general purpose program for performing the analysis and design of a wide variety of types of structures. The basic three activities which are to be carried out to achieve that goal:

a) Model generation

b) The calculations to obtain the analytical results

c) Results verification is all facilitated by tools contained in the program's graphical environment.

Also, STAADPro is used for static or dynamic analysis of bridges, transmission tower, steel, concrete, aluminum or timber buildings, embedded structures (tunnels and culverts), stadium or other simple or complex structures.

The program is a readily available to analyze plane frames and space frames. The program is in two parts – input data and output. In details, this part consists of:

Data i) joint coordinates referenced to the frame axis

- ii) member incidence and their properties
- iii) support conditions pinned or fixed
- iv) separate load cases

output i) joints displacement

ii) the axial forces, shears and moments at ends of each memberiii) equilibrium checks.

1.2 PROJECT DESCRIPTION

The objectives of the project include the following:

- To familiarize with the structural analysis and design commercial program STAADPro. This is achieved by modeling, analyzing and designing a simply supported beam in STAADPro and verifying results by hand calculations.
- To study braced and unbraced framing system carrying vertical and lateral, by defining them and see how they affect the stability of the building.

- To study and evaluate the framing system of an existing industrial building with fixed supports according to BS5950.
- To propose, model and design using STAADPro two alternative framing systems for the above building
- To discuss the merits of the three framing alternatives system, by pointing out the role and influence of fixed and pinned supports in a structure.
 Also, the effect of bracing on a structure.
- Finally, to prepare typical structural drawings of each framing system studied.

CONTENTS

Acknowledgements	5
CHAPTER 1: INTRODUUCTION	6
1.1 General	7
1.2 Project description	7
CHAPTER 2: VERIFICATION	9
2.1 Examples of problems	
2.1.1 Model and design of a simply supported beam	
2.1.2 Hand calculations	
2.2 Comparison	
CHAPTER 3: BRACED AND UNBRACED STRUCTURES	19
3.1 Definitions	
3.1.1 Braced and unbraced structures	
CHAPTER 4: DESIGN OF THE FRAMING SYSTEM OF AN EXISTING	
INDUSTRIAL BUILDING	22
LATTICE GIRDER AND COLUMN CONSTRUCTION WITH FIXED SUPF	PORTS

4.1 Introduction

4.2 Design

4.1.2 Loading

4.1.2.1 Frame analysis

CHAPTER 5: TWO PROPOSED ALTERNATIVE FRAMING

SYSTEMS FOR THE ABOVE BUILDING 27

5.1 Lattice girder and column construction with pinned supports but supports

1,2,20 and 21 are fixed in the X-direction and release in the Z-direction

ŝ

5.2 Lattice girder and column construction with pinned supports with supports 1,2,20 and 21 fixed

CHAPTER 6: MERITS OF THE THREE FRAMING ALTERNATIVES 29

- 6.1 Lattice girder and column construction with fixed supports
- 6.2 Lattice girder and column construction with pinned supports but

Supports 1,2,20 and 21 are fixed in the X-direction and release in the Zdirection

6.3 Lattice girder and column construction with pinned supports with

Supports 1,2,20 and 21 fixed

CONCLUSION:

CHAPTER 7: APPENDICES: STAADPro output

33

A. Simply supported beam

- 33
- B. Lattice girder and column construction with fixed supports
- C. Lattice girder and column construction with pinned supports but Supports
 - 1,2,20 and 21 fixed in the X-direction and release in the Z-direction

CHAPTER 8: TYPICAL STRUCTUR			37		
Supports 1,2,20 and 21 fixed			36		
D. Lattice girder and column	construction	with	pinned	supports	with

REFERENCES