

**HIGHER TECHNICAL INSTITUTE**

**ELECTRICAL ENGINEERING DEPARTMENT**

**DIPLOMA PROJECT**

**DESIGN OF THE ELECTRICAL SERVICES  
OF A BUILDING**

**E. 1389**

**HADIITHOMAS CHRISTOFOROS**

**JUNE 2006**

A

**HIGHER TECHNICAL INSTITUTE**

**ELECTRICAL ENGINEERING DEPARTMENT**

**DIPLOMA PROJECT**

**DESIGN OF THE ELECTRICAL SERVICES  
OF A BUILDING**

E.1389

**HADJITHOMAS CHRISTOFOROS**

JUNE 2006

HIGHER TECHNICAL INSTITUTE	PROJECT NO 3641
----------------------------------	--------------------

DESIGN OF THE ELECTRICAL SERVICES  
OF A BUILDING

PROJECT SUBMITTED BY  
**HADJITHOMAS CHRISTOFORS G.**

TO THE DEPARTMENT OF ELECTRICAL  
ENGINEERING OF THE HIGHER TECHNICAL  
INSTITUTE  
NICOSIA – CYPRUS

IN PARTIAL REALISATION OF REQUIREMENTS  
FOR THE DIPLOMA OF

**TECHNICIAN ENGINEER  
IN  
ELECTRICAL ENGINEERING  
JUNE 2006**

PROJECT SUPERVISOR: Mr AVRAAM GEORGIU  
LECTURE OF THE ELECTRICAL ENGINEERING  
DEPARTMENT, H.T.I.

HIGHER TECHNICAL INSTITUTE	PROJECT NO 3641
----------------------------------	--------------------

# CONTENTS

	PAGE
<b>ACKNOWLEDGEMENTS</b>	1
<b>SUMMARY</b>	2
<b>INTRODUCTION</b>	3
<b>CHAPTER 1: ILLUMINATION DESIGN</b>	
1.1. Introduction	5
1.2. Definitions and units	5
1.3. Rules for energy efficient lighting	6
1.4. Methods of illumination calculation	7
1.5. Procedure of the Lumen method	8
1.6. Typical calculation	9
1.7. Tables of illumination design	10
<b>CHAPTER 2: LIGHTING CIRCUIT DESIGN</b>	
2.1. Introduction	12
2.2. Typical calculation	12
2.3. Table of Results	16
<b>CHAPTER 3: SOCKET OUTLET DESIGN</b>	
3.1. Introduction	18
3.2. Typical calculation	18
3.3. Table of Results	22
3.4. Residual current device	23
<b>CHAPTER 4: FIXED ELECTRICAL APPLIANCES</b>	
4.1. Cooker unit calculations	24
4.2. Washing machine calculations	28
4.3. Water heater calculations	31
4.4. Refrigerator calculations	34
4.5. Water pump calculations	37
4.6. Lift motor calculations	40
4.7. Tables of Results	43
<b>CHAPTER 5: STORAGE HEATERS DESIGN</b>	
5.1. Introduction	45
5.2. Typical calculations	45
5.3. Table of Results	48
5.4. Calculation of the supply cables	50
5.5. Table of Results	54
<b>CHAPTER 6: AIR CONDITION DESIGN</b>	
6.1. Typical calculations	55
6.2. Table of Results	58

## **CHAPTER 7: LIGHTNING PROTECTION DESIGN**

7.1.	Introduction	60
7.2.	Lightning conductor	60
7.3.	Effects of lightning strike	60
7.4.	Need for protection	61
7.5.	Zone for protection	62
7.6.	Down conductors	62
7.7.	Estimation of exposure risk	62

## **CHAPTER 8: FIRE ALARM SYSTEM**

8.1.	Introduction	64
8.2.	Manual fire alarm system	64
8.3.	Equipment	64
8.4.	Design	65
8.5.	Cables used	66

## **CHAPTER 9: TELEPHONE DESIGN**

9.1.	Introduction	67
9.2.	Definitions and terms	67
9.3.	Earthing	69
9.4.	Installation of the access cable	69
9.5.	Installation of the conduits	70
9.6.	Conduit schematic	72

## **CHAPTER 10: INSPECTION AND TESTING**

10.1.	Introduction	75
10.2.	Visual inspection	75
10.3.	Testing	75

## **CHAPTER 11: DISTRIBUTION BOARDS AND PHASE BALANCING**

11.1.	Apartment distribution boards	79
11.2.	DB01 (Common D/B)	82
11.3.	Table of Results	85

## **CHAPTER 12: MATERIALS AND COSTING**

12.1.	Introduction	86
12.2.	Analytical method	86
12.3.	Material costing	87
12.4.	Costing evaluation	91

<b>CONCLUSIONS</b>	92
--------------------	----

<b>REFERENCES</b>	93
-------------------	----

<b>APPENDICES</b>	94
-------------------	----

<b>DRAWINGS</b>	
-----------------	--

## ACKNOWLEDGEMENTS

I would like to express my thanks to my project supervisor, Mr A. Georgiou lecturer of the Electrical Engineering Department of H.T.I. for this valuable guidance and assistance for the completion of this project.

Also I would like to thanks all the engineers helped me in providing the necessary information as specifications, technical data, price lists of the equipments used, and to all the lectures of H.T.I who helped me and gave me valuable knowledge to complete the electrical engineering course.

## SUMMARY

The purpose of this project is to examine and study the design of electrical services of a building. The whole design must be carried out with care and responsibility as it is directly involved with the safety of people, livestock and property.

The whole design must be carried out in accordance to the IEE wiring regulations 16<sup>th</sup> edition, EAC and CYTA regulations.

The design of the electrical services of the building is explained in detail to the various chapters of this project. The main body of the project is divided in 12 chapters in order to simplify the study of the project.

At the end of the project appendices are included giving specifications for the devices and equipments used.

And at the end detail architectural drawings are provided showing the locations of the equipment used.