



**HIGHER TECHNICAL INSTITUTE**  
**ELECTRICAL ENGINEERING DEPARTMENT**

**DIPLOMA PROJECT**

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

Project No: **E.1400**

Project reported by **Christodoulou Andreas**

**PROJECT SUPERVISOR: MR G. KOURTELLIS**

Lecturer in electrical engineering department of H.T.I.

**JUNE 2006**

HIGHER TECHNICAL INSTITUTE	PROJECT NO
	3652

# **ELECTRICAL SERVICES OF A MULTISTOREY BUILDING**

## **ACKNOWLEDGEMENTS:**

I would like to express my thankfulness and appreciation to my supervisor Mr G. kourtelli for his valuable help and guidance given to me throughout the project period. Also I want to thank my supervisor of electrical installation on the second module of the training for his help by giving me helpful informations for the electrical services of my multistory building.

## **SUMMARY:**

The electrical services of the multistorey building was designed considering the IEE wiring Regulations of the 16<sup>th</sup> edition. We design the electrical services of the building with the 16<sup>th</sup> edition in order to verify that our installations are safe to persons property and livestock.

The electrical services designs consists of the socket outlets circuits, lighting circuits, fixed appliances, storage heaters, air conditions, tv installation, telephone installation and lightning protection system.

The multistorey building consists 4 floors including the ground floor. Ground floor consists the meter room, the entrance room, parking and eight storehouses where each flat has his own storehouse.

First and second floors consists of three flats in each floor where all flats. The third floor has only two flats but the load is the same. Each flat has his own meter in the meter room.

Finally in the electrical services of our multistory building we do inspection and testing in order to be safe to persons property and livestock.

### **Terms and conditions**

1. Three-phase 415 Vrms 50Hz, T.T. earthing system.
2. Architectural drawing will be provided.
3. The IEE Wiring Regulations 16<sup>th</sup> Edition as currently amended and the local EAC conditions of supply must be complied.
4. The illumination design must be in accordance with the CIBS code.
5. CYTA requirements to be taken into consideration.

# CONTENTS

	<u>Page</u>
<b>ACKNOWLEDGEMENTS</b>	<b>i</b>
<b>SUMMARY</b>	<b>ii</b>
<b><u>CHAPTER 1: ILLUMINATION DESIGN AND CALCULATIONS</u></b>	<b>1</b>
1.1. General informations	1
1.2. Important terms	1
1.3. Illumination calculations for first floor	2
1.3.1. Flat 101(kitchen)	2
1.3.2. Flat 101 (living room+ Hall)	4
1.3.3. Flat 101 (Bedroom 2)	5
1.4. Tabulated results for illumination calculations	6
<b><u>CHAPTER 2: LIGHTING CIRCUITS</u></b>	<b>8</b>
2.1. General informations	8
2.2. Lighting calculations for ground floor	8
2.2.1. Live conductor calculations for L1 (common use)	8
2.2.1.1. Voltage drop calculation	9
2.2.2. CPC sizing calculations	9
2.2.3. Conduit size calculations	10
2.3. Lighting calculations for first floor	11
2.3.1. Live conductors for L1 (Flat 101)	11
2.3.1.1. Voltage drop calculation	11
2.3.2. Shock protection	12
2.3.3. Conduit size calculations	13
2.4. Tabulated results for lighting Circuits	14

<b><u>CHAPTER3 SOCKET OUTLETS</u></b>	<b>15</b>
3.1. General informations	15
3.2. Ring circuit calculations for S1 (Ground floor)	15
3.2.1. Live conductor calculations	16
3.2.1.1. Voltage drop calculations	16
3.2.2. CPC sizing calculations	18
3.2.3. Conduits size calculations	20
3.3. Ring circuit calculations flat 101(S1)	20
3.3.1. Live conductor calculations	20
3.3.1.1. Voltage drop calculation	21
3.3.2. CPC sizing calculations	22
3.3.3. Conduits size calculations	23
3.4. Tabulated results for socket outlets	24
<b><u>CHAPTER 4: FIXED APPLANCES</u></b>	<b>25</b>
4.1. General informations	25
4.2. Cooker unit calculations for flat 101	25
4.2.1. Live conductor calculations	25
4.2.1.1. Voltage drop calculations	26
4.2.2. CPC sizing calculations	26
4.2.3. Conduits size calculations	27
4.2.4. Tabulated results for cooker unit	28
4.3. Electric ceramic hop calculations for flat 101	28
4.3.1. Live conductor calculations	28
4.3.1.1. Voltage drop calculation	29
4.3.2. CPC sizing calculation	29
4.3.3. Conduit size calculations	30
4.3.4. Tabulated results for electric ceramic hobs	31
4.4. Refrigerator calculations for flat 101	31
4.4.1. Live conductor calculations	31

4.4.1.1. Voltage drop calculation	32
4.4.2. CPC sizing calculations	32
4.4.3. Conduits size calculations	33
4.4.4. Tabulated results for refrigerator	34
4.5. Washing mashing calculations for flat 101	34
4.5.1. Live conductor calculations	34
4.5.1.1. Voltage drop calculation	35
4.5.2. CPC sizing calculations	35
4.5.3. Conduit size calculations	36
4.5.4. Tabulated results for washing machine	37
4.6. Water heater calculations for flat 101	37
4.6.1. Live conductor calculation	37
4.6.1.1. Voltage drop calculation	38
4.6.2. CPC sizing calculation	38
4.6.3. Conduit size calculations	39
4.6.4. Tabulated results for water heater	40
4.7. Lift calculation (Common used)	40
4.7.1. Live conductor calculations	40
4.7.1.1. Voltage drop calculation	41
4.7.2. CPC sizing calculations	41
4.7.3. Conduits size calculations	43
<b><u>CHAPTER 5: STORAGE HEATERS</u></b>	<b>44</b>
5.1. General informations	44
5.2. Storage heaters calculations for first floor (flat 101)	44
5.2.1. Live conductor Calculations	45
5.2.2. Voltage drop calculation for case 1	46
5.2.2.1. CPC sizing calculations	46
5.2.2.2. Conduit size calculations	47

5.2.3. CPC sizing calculation	48
5.2.3.1. CPC sizing calculations	48
5.2.3.2. Conduit size calculations	49
5.3. Phase balancing of storage heater	50
5.3.1. Phase balancing table for flat 101	50
5.3.1.1. Main supply cable calculations (Live conductors)	50
5.3.1.2. Voltage drop calculation	50
5.3.1.3. CPC sizing calculations	51
5.3.1.4. Conduit size calculation	51
5.3.2. Phase balancing table for flat 202	52
5.3.2.1. Main supply cable calculations (Live conductor)	52
5.3.2.2. Voltage drop calculation	53
5.3.2.3. CPC sizing calculations	53
5.3.2.4. Conduit size calculations	54
<b><u>CHAPTER 6: AIR CONDITIONING</u></b>	<b>55</b>
6.1. General Informations	55
6.2. A/C Calculations for living room (Flat 101)	55
6.2.1. Live conductor calculations	55
6.2.1.1. Voltage drop calculation	56
6.2.2. CPC sizing calculations	56
6.2.3. Conduit size calculations	57
6.3. A/C3 calculations for bedroom 2 (Flat 101)	57
6.3.1. Live conductor calculations	57
6.3.1.1. Voltage drop calculation	58
6.3.2. CPC sizing calculations	58
6.3.3. Conduit size calculations	59
6.4. Tabulated results for air conditions	59



<b><u>CHAPTER 7: MAN SUPPLY CALCULATION</u></b>	<b>61</b>
7.1. General informations	61
7.2. Diversity calculations	61
7.2.1. Calculations for ground floor (Common use)	61
7.2.1.1. Voltage drop calculation	62
7.2.1.2. CPC sizing calculations	62
7.2.1.3. Conduit size calculation	62
7.2.2. Calculations floor first floor (Flat 101)	63
7.2.2.1. Voltage drop calculation	64
7.2.2.2. CPC sizing calculations	64
7.2.2.3. Conduit size calculations	64
7.2.3. Calculation for second floor (Flat 202)	65
7.2.3.1. Voltage drop calculation	66
7.2.3.2. CPC sizing calculations	66
7.2.3.3. Conduit size calculations	66
7.3. Single line diagrams	67
7.3.1. Single line for ground floor	67
7.3.2. Single line diagram for flat 101,201 and 301	68
7.3.3. Single line diagram for flat 102,103,202,203 and 302	69
<b><u>CHAPTER 8: EARTHING</u></b>	<b>70</b>
8.1. Introduction	70
8.2. Protective	70
8.2.1. Types of protective conductors	70
<b><u>CHAPTER 9: INSPECTION AND TESTING</u></b>	<b>72</b>
9.1. General informations	72
9.2. Visual inspection	72
9.3. Testing siquense	73

9.3.1. Before the supply is connected	73
9.3.1.1. Continuity of protectors	73
9.3.1.2. Continuity of ring final circuit conductors	73
9.3.1.3. Insulation resistance	74
9.3.1.4. Correct polarity on the conductors exists.	75
9.3.2. With the supply connected	76
9.3.2.1. Earth fault loop impedence	76
<b><u>CHAPTER 10: TELEPHONE INSTALLATION</u></b>	<b>77</b>
10.1. General informations	77
10.2. Table	78
10.3. Conduit calculations	78
10.4. Conduit schematic	79
10.5. Wiring schematic	80
10.6. List of connections	81
<b><u>CHAPTER 11: CENTRAL ANTENNA WIRING</u></b>	<b>82</b>
11.1. General informations	82
11.2. Materials required and installation	82
<b><u>CHAPTER 12: LIGHTNING PROTECTION DESIGN</u></b>	<b>83</b>
12.1. General informations	83
12.1. Definitions for the lightning protection system	83
12.3. Lighting design calculations	85
<b><u>CHAPTER 13: COSTING</u></b>	<b>86</b>
13.1. General informations	86
13.2. Labour and material cost	86
13.3. Tabulated results for costing	87
APPENDIXES	
DRAWINGS	