# DESIGN OF THE ELECTRICAL SERVICES OF A BUILDING

by ANDREOU ARTEMIOS

**Project Report** 

Submitted to

the Department of Electrical Engineering of the Higher Technical Institute Nicosia, Cyprus

In partial fulfillment of the requirements for the diploma of

TECHNICIAN ENGINEER IN ELECTRICAL ENGINEERING

# **JUNE 1995**

HUMME 2422

PHONET NO

# ACKNOWLEDGEMENTS

I would like to express my sincere appreciation and thanks to my project supervisor Mr Ch. Chrysafiades for his valuable help and supervision during the whole process of this work.

Also I would like to thank everyone who helped me, especially to Mr Ch. Siamishi in any way such as providing necessary information, specifications and technical data or suggesting methods for the better presentation of this project.

Finally I would like to thank Miss Alexia Chrysochou (my typist) for her valuable understanding.

### SUMMARY

#### DESIGN OF THE ELECTRICAL SERVICE OF A BUILDING

#### Submitted by: Andreou Artemios

The objectives of this project are:

- 1) To design the electrical installation of a multistorey building pertaining to a block of flats.
- 2) To study the illumination engineering work involved and costing, including labor.

#### **Terms and Conditions**

- 1) Voltage supply 415/240V, 50Hz
- The work must be carried out with reference to the plans provided.
- 3) Supply for lift room and machinery
- 4) Three suitable water pumps should be considered
- 5) I.E.E. and E.A.C. regulations must be complied with
- 6) In designing the lighting load the CIBS code must be considered

2422

## CONTENTS

## PAGE

ANKOWLEDGEMENTS	
SUMMURY	
INTRODUCTION	
CHAPTER 1: ILLUMINATION DESIGN	
1.1 INTRODUCTION	1
1.2 ADVANTAGES OF GOOD ILLUMINATION	1
1.3 USEFUL DEFINITIONS AND UNITS	1
1.4 RULES FOR ENERGY EFFICIENT LIGHTING	2
2.0 ILLUMINATION DESIGN PROCEDURE	3
2.1 METHODS OF ILLUMINATION CALCULATIONS	3
2.2 CALCULATION PROCEDURE	4
2.3 TYPICAL CALCULATIONS	5
2.5 RESULTS OF ILLUMINATION DESIGN	14
CHAPTER 2: ELECTRICAL INSTALLATION	
2.1 REQUIREMENTS OF AN ELECTRICAL INSTALLATION	18
2.1.1 CABLES	18
2.1.2 CONDUITS	18
2.1.2.1 ADVANTAGES AND DISANDVANTAGES	19
2.1.3 PROTECTIVE BOARD	19
2.1.4 DISTRIBUTION DEVICES	19
2.2 SELECTION OF LIVE CONDUCTORS	19
2.2.1 WHAT IS A CABLE	19
2.2.2 CORDINATION OF CONDUCTORS	19
2.3 PROTECTION FOR SAFETY	20
2.3.1 GENERAL	20

2.3.2 OVERCURRENT PROTECTION	20
2.3.2.1 SHORT CIRCUIT PROTECTION	21
2.4 ELECTRIC SHOCK PROTECTION	21
2.4.1 PROTECTION AGAINST DIRECT CONTACT	21
2.4.2 PROTECTION AGAINST INDIRECT CONTACT	21
2.5 TYPES OF BONDING	22
2.6 ISOLATION AND SWITCHING	22
2.7 DISTRIBUTION	22
CHAPTER 3: LIGHTING CIRCUITS	
3.1 GENERAL	23
3.2 DESIGN CALCULATIONS OF A TYPICAL LIGHTING CCT (for the retire DB15, DB16 L1)	28
3.3 DESIGN CALCULATIONS OF A TYPICAL LIGHTING CCT (for the 4th, 3rd, 2nd, 1st floors DB14, DB12, DB10, DB8, L1).	31
3.4 DESIGN CALCULATIONSOF A TYPICAL LIGHTINGCCT(for the ground floor DB5, L2)	12
3.6 RESULTS OF ALL LIGHTING CIRCUITS	39
CHAPTER 4: SOCKET OUTLETS	
4.1 GENERAL	40
4.1.1 DESIGN CALCULATIONS OF A TYPICAL RING CIRCUIT (S2) FOR THE FIRST, SECOND, THIRD, FOURTH FLOORS	40
4.2.1 DESIGN CALCULATION OF A RING CIRCUIT (S1) FOR THE GROUND FLOOR	45
4.3 DESIGN CALCULATIONS OF A TYPICAL RADIAL CIRCUIT (S2) FOR THE GROUND FLOOR	49
4.4.1 DESIGN CALCULATION OF A TYPICAL RING CIRCUIT (S1) FOR THE RETIRE	52
4.5 RESULTS OF ALL SOCKET OUTLETS CIRCUITS	57
CHAPTER 5: FIXED APPLIANCES	
5.1 COOKER UNIT	58

5.2 WATER HEATER	61
5.3 WASHING MACHINE	65
5.4 MAIN SUPPLY CABLE	67
CHAPTER 6: FAULT LEVEL CALCULATIONS	
6.1 SHORT CIRCUIT PROTECTION	74
6.2 CALCULATIONS FOR DB8	74
6.3 USE OF RCCB'S	76
CHAPTER 7: COMMON USE AREA INSTALLATION	
7.1 INTRODUCTION	77
7.2 SUPPLY FOR THE LIFT MOTOR AND THE MACHINE ROOM	77
7.2.1 ISOLATORS	77
7.2.2 LIFT MOTOR CIRCUIT	78
7.2.3 SOCKET OUTLETS CIRCUIT	80
7.2.4 LIGHTING CIRCUIT	84
7.2.5 SUPPLY CABLE FOR DB1	84
7.3 SUPPLY TO WATER PUMPS	85
7.4 STAIRS	88
7.5 CORRIDORS	92
7.6 PARKING PLACE (A)	97
7.7 PARKING PLACE AND CORRIDOR IN THE GROUND FLOOR	101
7.8 LIGHTING CIRCUIT (L6)	105
CHAPTER 8: INSPECTION AND TESTING	
8.1 INTRODUCTION	109
8.2 VISUAL INSPECTION	109
8.3 TESTING	109
8.4 PERIODIC INSPECTION AND TESTING CERTIFICATION AND REPORTING	111

# CHAPTER 9: TELEPHONE INSTALLATION

9.1 INTRODUCTION	112
9.2 USEFUL DEFINITIONS AND TERMS BASIC PRINCIPLES GOVERNIGN THE INTERNAL TELECOMUNICATION NETWORK	113
COMPLETE DESIGN SUBMITTED BY C.Y.T.A.	114
CONDUIT AND WIRING SCHEMATIC	117
CHAPTER 10: LIGHTING CIRCUITS	
10.1 IMPONTANCE OF PROPER COSTING	118
10.2 METHODS AVAILABLE	118
10.3 ESTIMATING PROCEDURE	119
CONCLUSIONS	
REFERENCES	

APPENDICES

SINGLE LINE DIAGRAMS

SCHEMATICS

LEGENT