

HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING COURSE

DIPLOMA PROJECT

DESIGN OF ELECTRICAL SERVICES

OF A FACTORY

E / 999

BY: CHRISTODOULOU CHRISTODOULOS

JUNE 1996

Design of the Electrical Services of a Factory

Project report submitted by

Christodoulou Demetriou Christodoulos

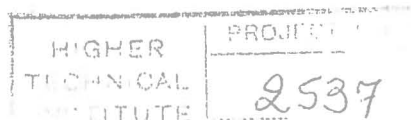
to the department of Electrical Engineering
of the Higher Technical Institute
Nicosia-Cyprus

in partial fulfillment of the requirements for the
Diploma of

Technician Engineer
in
Electrical Engineering

June 1996

Project Supervisor : Mr Efstathios Micheal
Lecturer of the electrical Engineering Department
,H.T.I



I dedicate this project to my parents for their guidance and support through out the three year course in HTI and specially to a beloved friend, Georgia , for her precious help and support.

ACKNOWLEDGMENT

I would like to express my thanks to my project supervisor ,Mr Efstathios Michael lecturer of the Electrical Engineering Department HTI, for his guidance and assistance for the completion of this project.

Contents

	<u>Page</u>
Appendices	i
Summary	ii
Introduction	ii
Chapter 1: Illumination Design	
1.1 General Information	1
1.2 Units and definitions	1
1.3 Design procedure	2
1.4 Uniformity arrangement	4
1.5 The Design	5
	7
Chapter 2: Lighting Circuit Calculations	
2.1 General	17
2.2 Procedure	18
2.3 The Design	20
Chapter 3: Socket Outlet Calculations	
3.1 General	45
3.2 Procedure	46
3.3 The Design	51
Chapter 4: Machine Load Calculations	
4.1 General	63
4.2 Procedure	64
4.3 The Design	66
Chapter 5: Main Switchgear and Fault Level Calculations	
5.1 Main Switchgear	85
5.1.1 Isolation and Switching	85
5.2 Protection	86
5.3 Distribution Boards Design	86
5.4 Balance and Diversity	87
5.5 Calculations for the selection of interconnecting Cables	91
5.6 Fault Level Calculations	97
5.7 Switchgear Specifications	100
5.8 Single Line Diagrams	100

Contents

	<u>Page</u>
Chapter 6 : Earthing	
6.1 Introduction	101
6.2 Methods of Earthing	101
6.3 Direct or Solid Method of Earthing	101
6.4 Earth Fault Loop Impedance	103
6.5 Earth Electrode	103
6.6 Earthing Requirements	103
Chapter 7: Power Factor Correction	
7.1 Introductory information	105
7.2 Calculations	107
Chapter 8 : Fire Alarm Design	109
Chapter 9 : Intruder Alarm System	120
Chapter 10 : Telephone Installation Design	
10.1 Introduction	127
10.2 Important Rules	129
10.3 The Design	135
Chapter 11 :Inspection and Testing	
11.1 Introduction	139
11.2 Inspection	139
11.3 Testing	141
Chapter 12 : Costing Evaluation	143
Conclusions	152

Appendices

Appendix 1: Illumination Fittings and Specifications.

Appendix 2: IEE Regulations , Tables and Charts.

Appendix 3: Switchgear and Specifications.

Appendix 4 : Fire Alarm Equipment and Specifications.

Appendix 4 : Intruder Alarm Devices and Specifications.

Appendix 5 : Telephone system equipment and specifications.

Appendix 6: Induction Motor Starting Methods

SUMMARY

The design of the electrical services of a factory and generally of any establishment is a laborious task which must be carried out with care and responsibility as it is directly involved with the safety of people , livestock and property .

The whole design was carried out according to IEE regulations 16th edition. For the Fire and Burglar alarm systems BS 5839 and BS4737 regulations were taken into account . For the telephone installation CYTA rules were considered. All devices used and equipment employed were selected to comply with the above mentioned rules.

The design of the electrical services of the factory is explained in details in the book. The book has been devided into chapters to simplify the study of the project . The contents of the book and of each chapter are given at the beginning . At the end of the book 6 appendices are included. In each appendix , there are tables and charts used in the design , manufacturers data catalogues giving specifications for the devices and equipment used , and eventually diagrams illustrating the construction of the systems.

INTRODUCTION

Design of the electrical services of a factory . As the title states , this project is to deal with the design of the electrical services of a furniture manufacturing factory.

The objectives of this project are:

1. To design the complete electrical services for a specified factory which include the following :

- Fire and burglar alarm systems.
- Telephone installation and internal communications.
- Power factor correction.

2. To study the illumination engineering work involved .

3. To provide all necessary diagrams , schedule of materials and costing including labour .

The project is undertaken from the following terms and conditions :

1. Supply : Three phase 415 Volts rms , TT earthing System.

2. Architectural drawings of the factory together with details of the load will be provided .

3. The design must be carried out in accordance with the IEE Wiring Regulations 16 th Edition as currently amended and the EAC conditions of supply.