

**THE DEVELOPMENT OF SOFTWARE FOR SELECTING
CIRCUIT PROTECTIVE CONDUCTOR (CPC) FOR LOW
VOLTAGE INSTALLATION ACCORDING TO IEE STANDARD**

Presented in the partial fulfillment for the award of the
Bachelor of Electrical Engineering (Honors)
UNIVERSITI TEKNOLOGI MARA



MOHD SYAHRIN BIN ABD RAZAK
2001190891
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR DARUL EHSAN

ACKNOWLEDGEMENT

BISMILLAHIRAHMANIRAHIM

In the name of Allah, Most Gracious and Most Merciful. Praise to Allah, the Lord of the Universe and Peace and Prayers be upon His final Prophet Muhammad s.a.w and Messenger. Alhamdulillah, for this project is finally completed.

First of all, I would like to take this opportunity to sincerely express my highest appreciation to my project supervisor, Ir Harizan Bin Hj Che Mat Haris for his guidance, suggestion, advices and constructive ideas in helping me throughout the course in this project.

I would like to extend my thanks and grateful to all those who have helped make this journey worthwhile. I express my deepest thanks and appreciation to my family for their moral support and encouragement to deliver the best work that I could. All my friends, together with whom I have shared my highs and lows, for all the opinions and suggestions. All those who have contributed information, knowledge, ideas, time and effort directly or indirectly in this progression of this project. Honestly, no words could make up for the things that they all done for me. I am grateful for all the favors and support. Thanks you and may Allah S.W.T. bless them.

Mohd Syahrin Bin Abd Razak

*Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA (UiTM)
Shah Alam, Selangor Darul Ehsan*

October 2004

ABSTRACTS

The manual calculation performed during designing a cable can be difficult and may create errors. This paper describes developed software to help the electrician to perform the calculation for selecting circuit protective conductor (increasingly called the cpc) in cable design process. The circuit protective conductor is a system of conductors joining together all exposed conductive parts and connecting them to the main earthing terminal. Strictly speaking, the term includes the earthing conductor as well as the equipotential bonding conductors. The developed software provides more accurate and faster results to the manual method. The software is developed using Visual Basic 6.0.

TABLE OF CONTENTS

CHAPTER		PAGE
1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Scope of Project	1
	1.3 Scope of Thesis	2
2	THE IEE REGULATION	
	2.1 International Basis	3
	2.2 The 16 th Edition	3
	2.3 Plan of The 16 th Edition	5
3	INSTALLATION REQUIREMENTS AND CHARACTERISTICS	
	3.1 Introduction	7
	3.2 Scope of The Regulation	7
	3.3 Legal Status of The Regulation	8
	3.4 Safety Requirement	9
	3.5 Definitions	9
	3.6 Assessment of General Characteristics	9
	3.7 Purposes, Supplies and Structure	10
	3.8 Low Voltage Generation Set	11
	3.9 Standards	12
	3.10 Undervoltage	12
4	INSTALLATION CONTROL AND PROTECTION	
	4.1 Introduction	13
	4.2 Switching	13
	4.3 Isolation	14
	4.4 Overload Currents	15
	4.4.1 Overload Currents	15
	4.4.2 Short Circuit Currents	15

4.5	Overload	16
4.6	Fuses	16
	4.6.1 Cartridge Fuses	17
	4.6.2 Semi-enclosed (Rewireable) Fuses	17
4.7	Miniature Circuit-breakers	18
4.8	Operating Time	19
5	CABLES	
5.1	Introduction	24
5.2	Cable Insulation Material	24
	5.2.1 P.V.C	24
	5.2.2 Thermosetting (XLPE)	25
5.3	Conductor Material	25
	5.3.1 Copper	25
	5.3.2 Aluminium	26
5.4	Low Voltage Cable	27
5.5	Medium Voltage Cable	28
6	EARTHING	
6.1	The Earthing Principle	29
	6.1.1 The Advantages of Earthing	30
	6.1.2 The Disadvantage of Earthing	31
6.2	Earthing Systems	31
	6.2.1 TT System	32
	6.2.2 TN-S System	33
	6.2.3 TN-C-S System	34
	6.2.4 TN-C System	34
	6.2.5 IT System	34
6.3	Earth-fault Loop Impedance	35
6.4	Earthing Conductors	35
6.5	Protective Conductors	36
6.6	Bonding Conductors	38
6.7	Earth Electrodes	39