

<b>Contents</b>	<b>Page</b>
5.0 SUMMARY, FURTHER WORKS AND CONCLUSIONS	34
5.1 Summary of the Study	34
5.1.1 Movements of Heavy Vehicles	35
5.1.2 Lack of Knowledge and Skills on New Jointing Techniques	35
5.2 Recommendations	35
5.2.1 Ground Reinforcement	35
5.2.2 Knowledge and Skills Audit	36
5.2.3 Jointing Materials	37
5.2.4 Data Management of Cable Joints	37
5.2.4.1 Data Recording	38
5.2.4.2 Computerisation of Data Management	38
5.2.5 Training	39
5.2.6 The Human Touch	39
5.3 Future Works	40
5.4 Conclusions	41

<b>Contents</b>	<b>Page</b>
2.2 Cable Joint	9
2.2.1 Cable Jointing Techniques	10
2.2.2 Knowledge and Skills	10
2.2.3 TNB Practice on Cable Jointing	11
2.2.4 Cable Jointer Training Scheme	12
2.2.5 Cable and Cable Joint Records	13
2.2.6 Causes of Cable Joint Failures	14
2.3 Impact of Cable Joint Failures on Availability of Supply and Profitability	14
2.3.1 Customers Dissatisfaction	15
2.3.2 Loss of Production	16
2.3.3 Costs of Repair	17
2.3.4 Opportunity Loss	18
2.4 Recent Study on Cable Joints	19
3.0 RESEARCH METHODOLOGY	21
3.1 Data	21
3.1.1 Secondary Data - Cable Joint Failures Report	21
3.1.2 Primary and Secondary Data - Post-mortem of Failed Cable Joints	22
3.2 Sample Design	22
3.3 Data Collection	23

<b>Contents</b>	<b>Page</b>
4.0 <b>RESULT OF SURVEY</b>	25
4.1 <b>Secondary Data - Cable Joint Failures Report</b>	25
4.1.1 <b>Cable Joint Failures by Location</b>	25
4.1.2 <b>Jointing Techniques and Age of Failed                     Cable Joints</b>	26
4.1.3 <b>Joints Done on Various Types of Cables</b>	27
4.1.4 <b>Ground Conditions of the Failed Cable                     Joints</b>	28
4.1.5 <b>Probable Cause of Cable Joint Failures</b>	29
4.1.6 <b>Loading of Cable Joints</b>	29
4.2 <b>Result of Post-mortem</b>	29
4.3 <b>Summary of the Findings</b>	30
4.3.1 <b>Unknown Response</b>	31
4.3.2 <b>Ground Conditions and Probable                     Cause(s) of Failures</b>	32
4.4 <b><i>Impact of Cable Joint Failures on Availability                     of Supply and Profitability</i></b>	33



## **TABLE OF CONTENTS**

<b>Contents</b>	<b>Page</b>
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
1.0 INTRODUCTION	1
1.1 Objectives	2
1.2 Scope of the Research	3
1.3 Foreseeable Problems	3
1.4 Organisation of the Report	3
2.0 CABLES, CABLE JOINTS, CABLE JOINT	5
FAILURES AND IMPACT OF UNAVAILABILITY	
OF SUPPLY AND PROFITABILITY	
2.1 Cables	5
2.1.1 Cable Design	5
2.1.2 Conductor	6
2.1.3 Types of Cable	6
2.1.3.1 Paper Insulated Cable	6
2.1.3.2 Crosslinked Polyethylene (XLPE) Cable	8
2.1.3.3 Oil Filled Cable	8
2.1.4 Expected Life Span	8
2.1.5 Cable Laying	9