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IEEE Guide for Investigating and Analyzing Power Cable, Joint, and Termination Failures on Systems Rated 5 kV through 46 kV

IEEE Power Engineering Society

Sponsored by the
Insulated Conductors Committee



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Insulated Conductors Committee
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Abstract: This guide applies to the process of investigating, evaluating, and analyzing field failures. This guide covers the overall format for failure analysis and subsequent guides will specifically address cables, joints, terminations and separable insulated connectors. Included is a recommended flow charting process that can be used to help guide an individual through the failure analysis process.

Keywords: documentation, examination, failures, failure analysis, flow charts, flow charting

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Introduction

This introduction is not part of IEEE Std 1511-2004, IEEE Guide for Investigating and Analyzing Power Cable, Joint, and Termination Failures on Systems Rated 5 kV through 46 kV.

The need for a guide to assist the electric utility industry in the analysis of failures related to system components has existed for many years. Extensive efforts have been made to develop such guides, but these efforts have frequently stalled because of the complexities involved. Many of these efforts have focused on the development of a classification system intended to categorize failures for the purpose of statistical analysis and industry wide data reporting of failure rates. However, the real value of failure analysis is in improving system performance, reliability, and increasing personnel safety.

This guide introduces a new approach that attempts to employ flow-charting techniques to lead an investigator through the steps necessary to identify the cause of a failure. However, the guide is not intended to be either all-inclusive or to be a document that can take the novice investigator through a failure analysis to the point of arriving at a reasonable conclusion regarding the exact cause of failure. Experience is a teacher that opens the mind to other possibilities beyond those that may seem obvious on the surface. As such, this guide is intended to provide documentation of failure mechanisms that have been identified in prior investigations and of the steps that may have led to the conclusions drawn. As investigators contribute new experiences and new instances of analysis, the guide will evolve to address new issues and the evolution of products developed to address the ever-changing needs of the electric utility industry. It will also serve as historic documentation of past shortcomings in engineering, design, application, and maintenance. In this way it is hoped the guide will contribute to continued product improvement and to the prevention of repeating the same mistakes in future product designs and applications.

This guide is the first of what is proposed to be a series of guides related to a common subject. The series will be designated by a common overall number with a point system of additional guides intended to address specific topics in failure analysis of the cable and accessories used on an underground electric utility system. Subsequent guides will specifically address cables, joints, terminations and separable insulated connectors respectively. The present guide attempts to establish a common format, methodology, and procedures for the development of the subsequent guides. It is also intended to provide the background information necessary to introduce an individual to the concepts and principles of failure analysis.

Much credit is to be extended to the Edison Electric Institute for its early efforts to develop a failure analysis guide for laminated insulated power cables. That guide ultimately resulted in a cable system design that was highly reliable and had an enviable history of service. Hopefully, this series of guides will extend that experience into the realm of modern cable systems.

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