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IEEE Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear

IEEE Power and Energy Society

Sponsored by the
Switchgear Committee

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(Revision of IEEE Std C37.24-2003)

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Abstract: Information to assist in evaluating the effect of solar radiation on outdoor metal-enclosed switchgear including metal-enclosed bus and control switchboards is provided in this guide. Specific data in the form of a continuous current capability factor for specific maximum monthly normal temperatures at the installation location to adjust the continuous current capability of outdoor metal-enclosed switchgear to the solar radiation condition required are given in this guide. Examples of maximum monthly normal temperatures along with sources for data for the US and for Canada are also presented in this guide.

Keywords: absorption coefficient, finish, IEEE C37.24™, metal-enclosed switchgear, outdoor, solar constant, solar radiation, temperature

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Introduction

This introduction is not part of IEEE Std C37.24–2017, IEEE Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear.

This guide is an outgrowth of a technical paper presented at the AIEE Winter general meeting in New York, N.Y., January 18–22, 1954. In October 1955, the paper was issued by AIEE Standards Committee as Publication 955. In 1962, 3000 A ratings were added and the temperature data from the National Oceanic and Atmospheric Administration were updated. Subsequently, it was revised and published as IEEE Std C37.24™-1971 (also identified as IEEE Std 144™-1971). A new section was added in the 1986 guide discussing color and finish of the metal-enclosed switchgear and their impact on temperature due to solar radiation. [1]

This guide is a revision of ANSI/IEEE C37.24™-2003. Standards references have been updated and the latest temperature data (for 1981–2010) for the US and Canada has been referenced. This revision also includes metrification of English units and the additional bibliographical entries to cover broad geographic locations.

This guide was prepared by a working group operating under the Switchgear Assemblies Subcommittee of the IEEE Switchgear Committee.

[1]Information on references can be found in Clause 2.

Contents

IEEE Guide for Evaluating the Effect of Solar Radiation on Outdoor Metal-Enclosed Switchgear

1. Overview

1.1 Scope

The general information in this guide is intended to assist in evaluating the effect of solar radiation on outdoor metal-enclosed switchgear, and is, for example, applicable to outdoor metal-enclosed circuit breaker power switchgear, metal-clad switchgear, metal-enclosed interrupter switchgear, metal-enclosed gas insulated switchgear, control switchboards, metal-enclosed bus, and pad-mounted switchgear. Specific data are given in current-temperature relationship, and tabulation form for its application to outdoor metal-enclosed low-voltage power circuit breaker switchgear, outdoor metal-clad switchgear, and outdoor metal-enclosed interrupter switchgear.

1.2 Purpose

Switchgear will perform satisfactorily and have a reasonable life expectancy when operated within the temperature limits established; for example, in the following standards:

— IEEE Std C37.20.1™[2, 3, 4]
— IEEE Std C37.20.2™
— IEEE Std C37.20.3™
— IEEE PCC37.20.9™/D3
— IEEE Std C37.21™
— IEEE Std C37.23™
— IEEE Std C37.74™
— IEEE Std C37.100.1™

These standards specify the temperature rise limits above a standard (maximum) ambient temperature of 40 °C. This is satisfactory for indoor applications where the temperature rise is due entirely to heat release (in-

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