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IEEE Guide for Recommended Electrical Clearances and Insulation Levels in Air Insulated Electrical Power Substations

IEEE Power and Energy Society

Developed by the
Substations Committee

IEEE Std 1427-2020™
(Revision of IEEE Std 1427-2006)

IEEE

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Abstract: This guide, covering three-phase ac systems from 1 kV to 800 kV, provides recommended electrical operating, safety clearances, and insulation levels in air-insulated electric supply substations; addresses insulation coordination procedures; provides design procedures for the selection and coordination of the insulation levels within the station as they relate to substation clearances; and addresses how reduced clearances in high-voltage ac substations will allow for compact bus arrangements and substation voltage uprating applications.

Keywords: basic lightning impulse insulation level (BIL), basic switching impulse insulation level (BSL), clearances, IEEE 1427™, insulation coordination, insulation levels, substation

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Introduction

This introduction is not part of 1427-2020, IEEE Guide for Recommended Electrical Clearances and Insulation Levels in Air Insulated Electrical Power Substations.

This guide was revised by members of Working Group D1 of the Substations Committee and is under the sponsorship of the Power and Energy Society.

Acknowlegment

The Working Group would like to thank Hamid Sharifnia for his work in putting this revision of the standard together.

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IEEE Guide for Recommended Electrical Clearances and Insulation Levels in Air Insulated Electrical Power Substations

1. Overview

1.1 Scope

This guide, covering three-phase ac systems from 1 kV to 800 kV, provides recommended electrical operating, safety clearances, and insulation levels in air-insulated electric supply substations; addresses insulation coordination procedures; provides design procedures for the selection and coordination of the insulation levels within the station as they relate to substation clearances; and addresses how reduced clearances in high-voltage ac substations will allow for compact bus arrangements and substation voltage uprating applications. This guide addresses insulation coordination procedures, including the choice of insulation levels and arrester specification, in limited detail and only as relevant to clearance requirements. Detailed and expanded coverage of insulation coordination procedures is provided in other ANSI and IEEE guides and standards (see Clause 2). This guide focuses on open-air bus assemblies and configurations and excludes apparatus clearances (i.e., bushing clearances for transformers, and breakers). Detailed coverage of apparatus clearances is provided in other applicable guides and standards.

1.2 Purpose

Proper electrical clearances are necessary for the design, construction, and operation of electric supply substations. This document develops guidelines for the application of recommended electrical clearances and insulation levels in air-insulated substations. The recommended clearances incorporate both design/operating clearances and safety clearances.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals is *required to*).[1,2]

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals is *recommended that*).

[1]The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.
[2]The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.