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IEEE Guide for Switchgear—Unit Substation—Requirements

STANDARDS

IEEE Power and Energy Society

Developed by the
Switchgear Committee

IEEE Std C37.121™-2020
(Revision of IEEE Std C37.121-2012)

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Switchgear Committee
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IEEE Power and Energy Society

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IEEE SA Standards Board

Abstract: The basis for the coordination of equipment in unit substations by assisting in the selection of components is intended as the use of this guide. A variety of designs for unit substations are possible using various combinations of incoming sections, transformer sections, outgoing sections, and transition sections. It is intended that the incoming, outgoing, transformer, and transition sections included in a unit substation meet the basic requirements of applicable industry standards for those sections. This guide covers three-phase unit substations for step-down operation in the range of 112.5 kVA or greater at primary voltages of 601 V through 52 kV.

Keywords: control, gas-insulated switchgear, distribution, fuse, IEEE C37.121™, metal-clad switchgear, metal-enclosed switchgear, metering, mobile unit substation, molded-case circuit breaker, motor control center, power circuit breaker, primary unit substation, radial substation, rectifier-type substation, secondary selective substation, secondary unit substation, spot-network substation, substation, surge protection, switchgear, transformer, transition section, unit substation

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Introduction

This introduction is not part of IEEE Std C37.121-2020, IEEE Guide for Switchgear—Unit Substation—Requirements.

IEEE Std C37.121-1989 was originally developed by a working group sponsored by the Power Switchgear Assemblies Technical Committee of the Switchgear Section (8SG) of the National Electrical Manufacturers Association (NEMA/SG/5). The document was transferred from NEMA to the IEEE Power and Energy Society Switchgear Committee, Switchgear Assemblies Subcommittee, in January of 2003. IEEE Std C37.121 was reaffirmed by the IEEE Standards Association Standards Board in 2006.

The Switchgear Assemblies Subcommittee Task Force, created to review this document, determined that this document did not meet the intent of a standard as it references applicable IEEE Standards for all requirements that are to be met by each component of a Unit Substation. Based on this review, the Task Force recommended that this document be changed from a standard to a guide. The recommendation was accepted by the Switchgear Assemblies Subcommittee.

In the revision of this document, the document has been revised to remove the specific exclusions of unit substations with load tap changing equipment and Gas Insulated Switchgear (GIS) from the scope of the document and to update the reference documents to the latest revisions. Other significant changes are as follows:

— Added 6.8 for Metal Enclosed Switchgear Incorporating Gas Insulation Systems with reference to IEEE Std C37.20.9.[1]

— Subclause 9.4, Metal Barriers, has been updated to provide more clarity with regards to intentional openings and viewing ports and windows.

— Subclause 11.6.2.1, Surge Protection, has been updated to provide guidance to reference documents on overvoltages caused by switching transients.

— Figure 18 has been redrawn to correctly show the Secondary unit substation – Radial type with reverse arrangement.

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

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1. Overview

1.1 Scope

This guide covers three-phase unit substations for step-down operation in the range of 112.5 kVA or greater at primary voltages of 601 V through 52 kV.

This guide does not cover the following installations:

a) Substations in which the transformer section is described and defined as "network," "subway," "vault," or "underground" in IEEE Std C57.12.24™ [B13] and IEEE Std C57.12.40™ [B15][2]

b) Substations in which the transformer section is described and defined as "pad-mounted"

c) Rectifier-type substations

d) Mobile unit substations

e) Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles

f) Installations for mines

g) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock, or for installations used exclusively for signaling and railway communication purposes

h) Installations of communication equipment that is under the exclusive control of communication utilities, located outdoors or in building spaces used exclusively for such installations

i) Installations under the exclusive control of electric utilities for the purpose of communication, or metering; or for the generation, control, transformation, transmission, and distribution of electric energy located in buildings used exclusively by utilities for such purposes or located outdoors on property owned or leased by the utility or on public highways, streets, roads, etc.; or outdoors by established rights on private property

1.2 Purpose

The guide is intended for use as the basis for the coordination of equipment in unit substations by assisting in the selection of components. A variety of designs for unit substations are possible using various combinations of incoming sections, transformer sections, outgoing sections, and transition sections.

[2]The numbers in brackets correspond to those of the bibliography in Annex A.