IEEE Guide for Bus Design in Air Insulated Substations

IEEE Power & Energy Society

Sponsored by the
Substations Committee

IEEE
3 Park Avenue
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IEEE Std 605™-2008
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Approved 10 December 2008
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Abstract: A proper design of the substation bus ensures a safe and reliable operation of the substation and the power system. Two different types of bus are used in substations, the rigid bus and the strain (cable). This guide provides information on the different bus arrangements used in substations stating the advantages and disadvantages of each. Also it provides information as related to each bus type and construction. Once the bus type is selected, this guide provides the calculation tools for each bus type. Based on these calculations, the engineer can specify the bus size, forces acting on the bus structure, number of mounting structures required, and hardware requirements.

Keywords: ampacity, bus support, corona, electromagnetic, finite-element, forces, ice, mounting structure, rigid bus structures, short circuit, strain-bus structures, substation design, wind

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Introduction

This introduction is not part of IEEE Std 605-2008, IEEE Guide for Bus Design in Air Insulated Substations.

This introduction provides some background on the rationale used to develop this guide. This information is meant to aid in the understanding and usage of this guide.

Buses consisting of conductor structures and the associated hardware comprise a large percentage of the substation equipment investment. The proper design of substation bus structures contributes to the safe and reliable operation of the substation and the power system. Two different types of buses are most commonly used in substations: rigid bus and strain bus (cable). This guide provides information on the different bus arrangements used in substations stating the advantages and disadvantages of each. Also, it provides information on each bus type and construction. Once the bus type is selected, this guide provides the calculation tools for each bus type. Based on these calculations, the engineer can specify the bus size, the forces acting on the bus structure, the number of mounting structures required, and the hardware requirements. However, this guide does not provide any guidance on the seismic design of bus structures, which is given in IEEE Std 693™-2005[a] and IEEE Std 1527™-2006.

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1. Overview

1.1 Scope

The information in this design guide is applicable to both rigid bus and strain bus designs for outdoor and indoor, air-insulated, alternating current substations. Ampacity, radio influence, vibration, and electromechanical forces resulting from gravity, wind, fault current, and thermal expansion are considered. Design criteria for conductor and insulator strength calculations are included.

This guide does not consider the following:

a) The electrical criteria for the selection of insulators (see IEEE Std 1313.2™-1999 [B22])

b) The seismic forces to which the substation may be subjected (see IEEE Std 693™-2005 and IEEE Std 1527™-2006)

c) The design of mounting structures

d) Design considerations for contaminated environments (see IEEE Std 1313.2-1999 [B22])

e) Installation methods

f) Design of direct current buses

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