Guide for Bus Design in Air Insulated Substations
Substations Committee
Working Group "D3"

Working group D3 of the Substation Committee is pleased to announce the completion of the "Guide for Bus Design in Air Insulated Substations", IEEE605-2010. A proper design of the substation bus insures a safe and reliable operation of the substation and the power system. This guide provides the information and the calculation process to select the proper bus/conductor ratings and the calculations of forces effecting the selection of the proper structures and insulators associated with the substation under consideration. To achieve these objectives, the guide provides the information as follows:

- Bus arrangements:

  Clause 4 provides the information on the advantages and disadvantages of the most common bus arrangements that have been used. Based on this given information, the substation engineer and other interested groups can select the appropriate bus arrangement for the substation under consideration.

- Bus Design Consideration:

  Clause 5 defines the bus and discusses different bus type construction: box structure, low profile rigid bus, strain (cable) bus and gas insulated bus. The advantages and disadvantages of each bus type have also been detailed. The working group hopes that the substation engineer and other interested groups will use this information to select the appropriate bus type.

- Conductor Data:

  Clause 6 and Annex E discuss types and properties of conductors used for both strain (cable) and rigid buses. The different types of bus hardware are also discussed.

- Design Considerations:

  Clause 7 discusses the bus design process. This refers the user to the applicable section to simplify the use of this guide.

- Current Calculation:

  Clause 8 section gives an over view of calculating the bus conductor ampacity. This section together with Annexes B & C provides ampacity tables and the calculation process to determine bus current ampacity rating for both rigid and cable bus designs.

- Corona Calculation:

  Clause 9 gives an over view of Corona and Radio Interference in substations. Annex D of the guide provides the calculation tools and guidance to determine the maximum resulting Corona. The user can then compare it with the allowable Corona Voltage to determine if Corona problems exist.

- Overview of mechanical design of bus structures

  Clause 10 introduces the loads applied to bus structures for consideration in the bus in designs, as well as the available calculation methods to evaluate their effects on the associated structures.

- Load Calculations:

  Clause 11 describes in detail the loads applied to the bus structures both rigid and strain bus and also provides the required equations to calculate these loads

- Dimensional, strength and other design considerations

  Clause 12 describes the required design considerations such as span length, insulator strength, deflection criteria, induced vibrations and clearances.

- Annex E provides the physical properties of common bus conductors. This information is to provide the engineer with the required information used in bus design calculations.

- Annexes F, G, H and I provide the substation engineer with examples of the design process described in the main body of this guide.

In summary, using the IEEE605-2009, the substation engineer can determine the following:

■ Bus arrangements
■ Bus Construction Type (rigid or strain)
■ Required bus conductor.
■ Span length for the rigid bus.
■ Loads that can be applied to the rigid bus. These loads are used for structure design and to select the required insulators strength for the rigid bus.
■ Loads that can be applied to strain bus structures, insulators and hardware. These loads are used to design the strain bus structures.
■ Supporting information is included in this guide to assist the user in the design calculations.
■ Examples are also included to clarify the design process provided in the main body of the guide.