



Fall 2011 (Boston) - IEEE Transformer Committee Meeting
Bushings Subcommittee
General Considerations of Bushings Installed in Metal Enclosed Bus

Introduction

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Employment History:

GE Power Systems, New Orleans, LA – Steam Turbine Field Engineer

ABB Inc, Alamo, TN – Senior Design Engineer / International Market Segment Manager

BS Mechanical Engineering, Louisiana Tech University

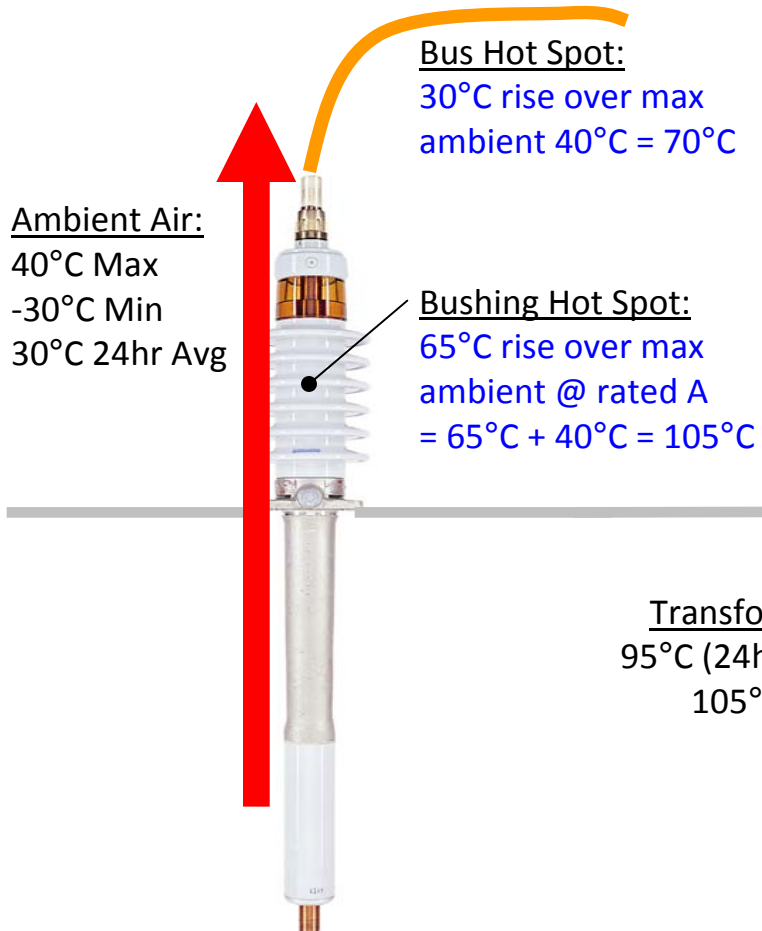
Current Secretary of WG PC57.19.04 – GSU Bushing Standard

Why?

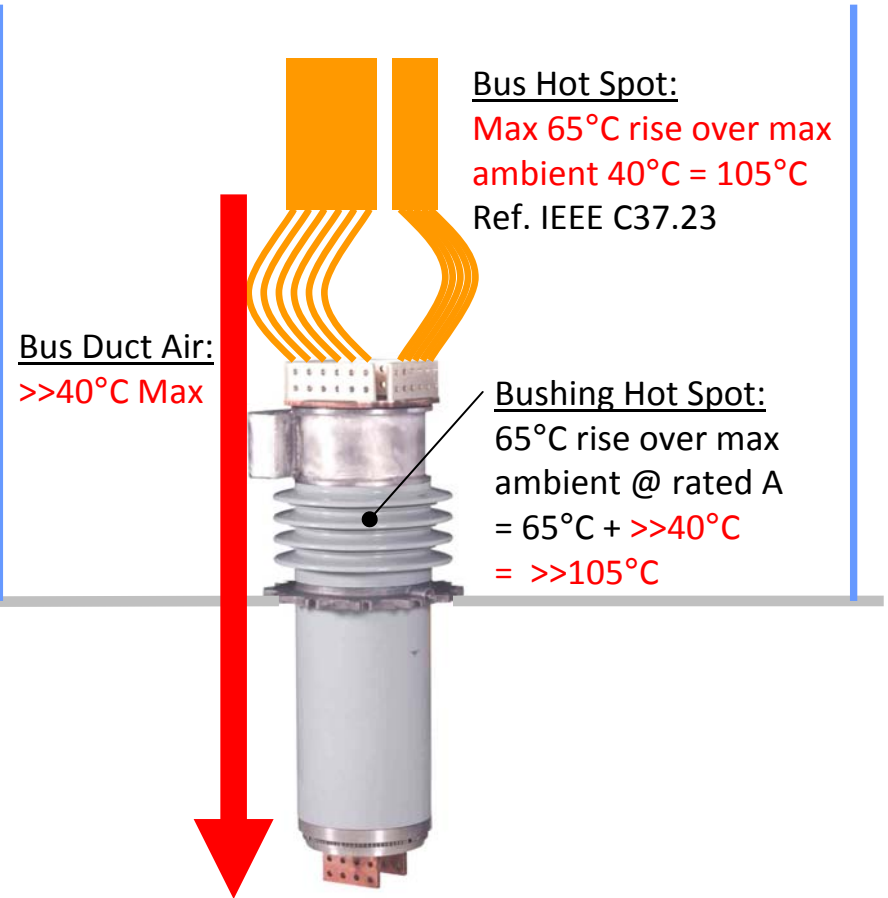
- Generate USER interest and participation in this new GSU Bushing Standard
- Show why a Standard is needed
- Briefly discuss differences between bushings applied in metal enclosed bus versus those electrically and dimensionally defined by C57.19.01 and tested to the requirements defined in C57.19.00
- Biggest obstacles this WG will encounter

Usual Service Conditions

Standard Bushing defined by
IEEE C57.19.01 & C57.19.00



Bushing installed in Metal Enclosed
Bus (Typical of LV GSU)



Other Notable Differences and Considerations

Standard Bushing defined by IEEE C57.19.01 & C57.19.00

- Oil level indication
- Condensers made from Kraft Paper Insulation (cellulose materials)
- Rating of bushing gaskets limited to less than 105°C
- Bushing's self-contained oil supply has known temperature
- Typically rated for <5000A
- Standard threaded terminals
- Installed in free air

Bushing installed in Metal Enclosed Bus (Typical of LV GSU)

- Typically No oil level indication
- Thermally upgraded condenser material needed to maintain adequate bushing life
- High temperature gaskets required to withstand temperatures >105°C
- Bushing's self-contained oil supply runs hotter than normal. Larger gas-to-oil ratio required to prevent excessive internal pressure and tendency for gas bubble evolution
- Typically rated 5000A or more
- No Standard for Terminal Connections
- Installed in non-ventilated, self-cooled enclosure

System Definition



- IEEE standards for Transformers
- IEEE standards for Metal Enclosed Bus
- NO proper IEEE standard for bushings installed in Metal Enclosed Bus
 1. Dimensional Standardization
 2. Heat Run / Thermal Tests Defined
 3. Usual Service Conditions Defined

Major Weakness at Elevated Temperatures

- Condenser kraft paper insulation
 - Loss of life due to high temperature aging
- Insulating Oil
 - Gassing and degradation at high temperatures
 - Hot oil expands to larger volume
- Gaskets
 - Service temperature = 105°C
 - Aging & loss of elasticity at higher temperatures
 - Loss of ability to maintain seal = oil leaks

Major Obstacles

- Reaching a consensus on Standard Dimensions
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