Medium-Voltage Metal-Clad Switchgear defined by IEEE C37.20.2 requires that all primary bus conductors and connections are covered with insulating material throughout. This insulation is not intended to be the primary insulation for the switchgear. The equipment is air-insulated, meaning that the conductors and energized parts are suitably spaced such that air provides the bulk of the required insulation between components. The bus bar insulation is only a part of the total insulation system.

The Standard calls for two dielectric ratings that establish the overall performance of the insulation system. The Lightning Impulse Withstand Tests establish that the spacing between conductors is correct. The Power Frequency Withstand Tests validate that the insulation system is suitable for the system voltage.

The requirement for bus insulation in MC switchgear comes from two concerns; that incidental contact with the conductor can start an arcing fault and that faults can propagate to other compartments via the bus. The purpose of the bus insulation is to prevent these failure modes from occurring. To validate the function of the bus insulation system, a third dielectric test, that is not an equipment rating, is performed as part of the product design or type testing. This is the Test for Bus Bar Insulation, Bus Joint Insulation, and Bus Tap Insulation.

The test is performed at the Rated Maximum Voltage for the equipment, not at the Power Frequency Withstand Test level. The bus insulation is covered with a conformal conductor that is at ground potential while the insulated bus bar is energized at Rated Maximum Voltage and Rated Frequency for one minute. The pass/fail criteria is that there can be no insulation breakdown during the one minute test.

Components used to insulate the bus bar like dipped epoxy coatings, sleeving, boots, caps, and tape must be tested to this requirement. They are not required to meet the full dielectric rating of the equipment as they are a component of the total system where the primary insulator is air.

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