Arc Flash Boundaries and Additional Precautions when Installing Arc Resistant Switchgear
Part 1 - Plenum and Exhaust Ducts

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The focus of arc resistant switchgear design and testing is to minimize the exposure of an operator performing normal duties to the by-products of the arc fault. This is typically accomplished by a reinforced switchgear design and fast acting protective schemes. These methodologies reduce the duration of the fault and prevent energy released during the fault from escaping into the designated protected areas around the switchgear.

The test guides commonly used for evaluating switchgear performance during an arc fault are designed to monitor the energy released into the accessible areas immediately surrounding the switchgear. This energy release is evaluated by observing the escaping gas with burn indicators and by physically observing any mechanical hazards such as falling debris, doors blown open from overpressure, or ejected parts. There is no procedure for evaluation of other hazards such as the thermo-acoustic wave or the release of toxic gases.

To minimize the potential hazards that are not specifically evaluated by the test procedures it is recommended that the switchgear employ a plenum and ducting assembly that can safely contain the thermo-acoustic wave and exhaust the gases to a controlled location. This location may be an isolated area within the building, but it is preferable to duct the gases outside of the building.

The duct should be of sufficient size and physical structure to withstand the pressure from the exiting gas and also designed to minimize turbulent flow such that it does not create any back pressures that could cause the switchgear to fail during an arcing fault (this must be proven as part of the arc fault testing).

Good design practice would also provide for the duct to slope away from the switchgear and be fitted with a weatherproof external cover to prevent any ingress of moisture. Additionally, in applications where the duct is exposed to cold, it may be necessary to equip the duct with a space heater to prevent condensation.

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