When a plenum and ducting system is utilized to control the by-products of an arcing fault several site considerations must be made with respect to where the gas will be vented. Because the gas release is at an elevated temperature and pressure and contains metallic particles and toxic components, the location of the vent must be isolated from personnel and sensitive equipment. Further, when the gas is vented into the building the structural capability of the building to withstand the overpressure and the effects of the smoke and toxic gas in a closed area must also be evaluated.

Due to the circuitous route the arc blast takes through the switchgear, the plenum, the duct system, a large part of the fault energy is attenuated inside the switchgear system. There is still a significant amount of energy that leaves the exhaust port and, depending on the speed of the protective scheme; a significant level of toxic gas and smoke may also be released.

Pressure measurement in the switchgear during testing reveals significant drops in value as the gas works its way to the exit point of the duct. A typical 63kA three phase fault in a circuit breaker compartment sees an average peak pressure in that compartment of 12 psi. That pressure is reduced to approximately 2 psi when it reaches the exhaust duct external cover. At this point the gas has traveled at least 8 feet and the drop in pressure reflects the loss of energy that occurs.

The gas temperature also drops exponentially as it moves from the source. The temperature of the fault gases exiting the duct in the typical test sample are around 200°C and will continue to cool as it moves from the vent. Unfortunately, the toxic nature of this gas does not decrease based on distance traveled and for that reason it is preferred to vent the gases outside of the building.

Additional precautions, beyond those concerned with the temperature of the gases, will be required when the gas is released in a confined space or building. These precautions include evaluation of the effect of an overpressure on the structure and the availability of light and fresh air.

The isolation area for the exhaust duct to vent into can be visualized as a 5 foot diameter cylinder around the centerline of the exhaust duct that extends 7 feet out from the exhaust duct opening. While the actual flow of gas resembles an ellipsoid within the borders of the described cylinder and will vary in intensity based on fault current level and proximity to the vent opening, using the cylinder dimensions as the borders of the isolation area provides a simple and effective method to define the space. This space must be free of personnel, sensitive equipment, and physical impediments to gas flow when the equipment is energized.
Arc Flash Boundaries and Additional Precautions when Installing Arc Resistant Switchgear
Part 2 - Exhaust Duct Gas

In almost every case, a duct exiting a building will be approximately 10 feet above grade. It is recommended that sensitive equipment that could be placed directly below the exhaust path and not extend into the isolation area be relocated to assure that metallic particles carried by the gas flow not drop into the equipment.

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