TECHNICAL ANNEX

INCIDENT ENERGY CALCULATION

Incident Energy, as defined by IEEE 1584 & NFPA 70E, is the amount energy impressed on a surface, a certain distance away from the source, generated during an electrical arc event. As definitions go, this is straight forward, but how do we calculate this? Well, the most common way is per equations found in IEEE 1584. (This is how our arc flash calculator app calculated incident energy) Where voltage is between 208 & 15kV, bolted fault current is between 700 & 106,000 Amps, and conductor gap is between 13mm & 153mm, we use the following steps (please note this process has been simplified and should not be used independently.)

First - Calculate the Arcing Fault Current

lg (Ia) = K + 0.662 lg (IB) + 0.0966 V + 0.000526 G + 0.5588 V lg (IB) – 0.00304 G lg (IB)

Where:
(lg) = log10
(Ia) = arcing fault current at the bus
(K) = –0.153 for open configuration or –0.097 for box configuration
(IB) = bolted fault current – 3phase sym rms kA at the bus
(V) = bus voltage in kV
(G) = is bus bar gap between conductors in mm

Then - Convert lg

Ia = 10 lg (Ia)
Ia br = Ia * IB br / IB

Where:
(IB br) = the Bolted Fault Current through each protective device.
(Ia br) = the arcing fault current through each protective device.

Next - Calculate the Incident Energy

lg (En) = K1 + K2 + 1.081 lg (Ia) + 0.0011 G

Where:
(En) = incident energy (J/cm2) normalized for a arcing duration of 0.2s and working distance of 610mm
(K1) = –0.792 for open configuration or –0.555 for box configuration
(K2) = 0 for ungrounded and high resistance grounded systems or –0.113 for grounded systems
(G) = the gap between bus bar conductors in mm
Solve En = 10 ^ lg En

Lastly - Convert Incident Energy from Normalized

E = 4.184 Cf En (t/0.2) (610^X / D^X)

Where:
(E) = incident energy (J/cm2)
(Cf) = 1.0 for voltage above 1 kV or 1.5 for voltage at or below 1 kV (t) = arcing duration in seconds
(D) = the working distance
(x) = the distance exponent