Technical note: 36 **Dated: 10th Feb 2016**

Subject: Example of short-circuit current calculations for a LV installation

Example of short-circuit current calculations for a LV installation supplied at 433 V (nominal) from a 630 kVA 11/0.433 KV MV/LV transformer

Calculation basis:

- The busbar and switchgear of Marshalling kiosk is sized for short time rating as per contribution from MV source through LT transformer.
- For circuits connected by transformer PU system is particularly suitable. By selecting suitable base kV for circuits the per unit reactance and resistance remains same, referred to either side (*HV or LV*) of transformer.
- For circuits connected by transformer same base kVA is selected for both the circuits (*HV and LV*) because power remains constant throughout so same base kVA should be considered throughout.
- As a rule only two bases should be selected first and from these two the remaining bases should be calculated. This is so because kV, kVA, I and Z are interrelated. They must obey ohms law. If we select base kVA and base kV than other base like base I and base Z are calculated from base kV and base kVA. Vice-versa will be inconvenient that is selecting base I and Z and calculating other bases like kV and kVA will make calculation difficult.

Input data to be collected:

1. Transformer Rating	= 0.63 MVA
2. Transformer Voltage ratio	= 11/0.433 kV
3. Frequency	= 50Hz
4. Transformer Impedance	= 5% = 0.05 PU
5. MV System fault level (Maximum)	= 40 kA
6. MV System fault MVA	= √3 x 40 x 11 = 762 MVA

Transformer Impedance levels

Base kVA	Minimum Impedance, %
0 – 150	Manufacturer's standard
151 – 300	4
301 – 600	5
601 – 2,500	6
2,501 – 5,000	6.5
5,001 – 7,500	7.5
7,501 – 10,000	8.5
Above 10,000	9.5

Calculation

Actual Fault Current available at AC distribution board

Base MVA	= 0.63
Base kV	= 11
Base Current in kA	= Base MVA/(√3 x Base kV) = 0.63/(√3 x 11) = 0.033
Base Impedance = (Base kV)^2 / Base MVA	= 192.1
Source Impedance = MV System fault MVA / Base MVA	= 0.0008
LT Transformer impedance at 0.63MVA & 11kV Base	= 0.05
Total MV system impedance (MV System + LT Transformer)	= 0.0508
Fault MVA contributed by Source through LT Transformer	= Base MVA / Total Impedance
	= 0.63 / 0.0508 = 12.40

Fault current contribution in kiloAmpers from MV system at LV side through (Switchyard) LT Transformer:

= Fault MVA x 1000 x 1000 / (√3 x 0.433 x 1000 x 1000)

= 12.40 x 1000 x 1000 / (√3 x 0.433 x 1000 x 1000)

= ***17.245 kA***

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