

Effect of Short-Circuit Current on Arc Flash Hazards

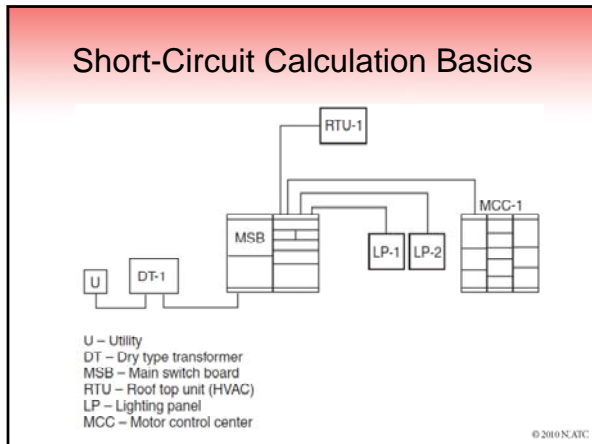
- Short-circuit currents can change over time due to changes in
 - Utility or Transformers
 - Generators or Motors
 - Building distribution system
- *NFPA 70E* Section 130.5 requires that arc flash hazard analysis be updated when major modification/renovation takes place
 - But not to exceed 5 years

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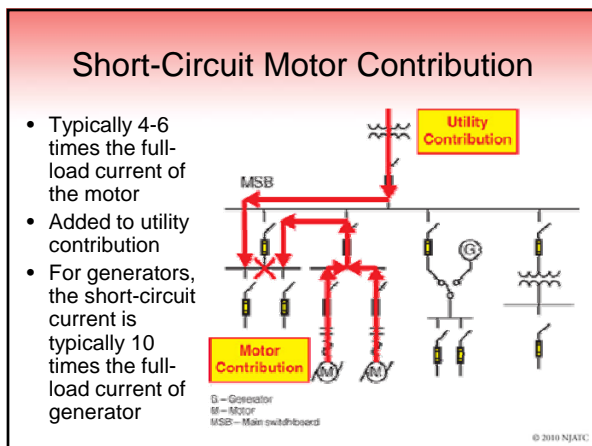
Short-Circuit Calculation Basics

- Calculate “bolted” 3-phase fault condition
 - Zero impedance connection – worst case
- Completed for all critical points in system:
 - Switchboards and Panelboards
 - Motor control centers (MCC)
 - Motor starters
 - Disconnect switches
 - Transfer switches

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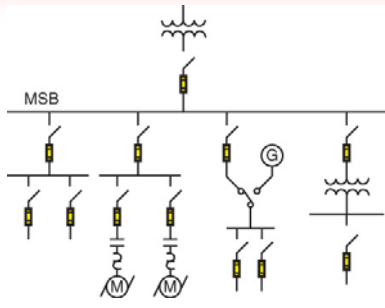


- ### Sources of Short-Circuit Current
- Utility generation
 - If electrical system is supplied by utility or customer owned transformer; short-circuit current depends on size (kVA) and Impedance (%Z) of transformer
 - Local generation
 - Synchronous motors
 - Induction motors
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Short-Circuit Current Factors

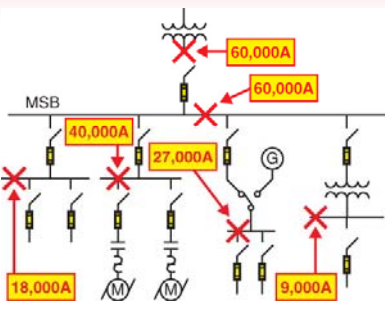
- Amount of short-circuit current depends on
 - Utility
 - Transformers
 - Generators
 - Motors
 - Voltage
 - Conductors
 - Busway



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Short-Circuit Current Factors

- Typically highest at service point
- Decreases in downstream equipment (due to impedance of transformers and conductors)



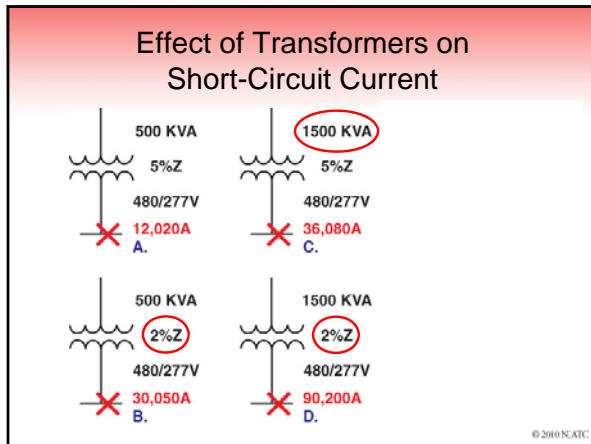
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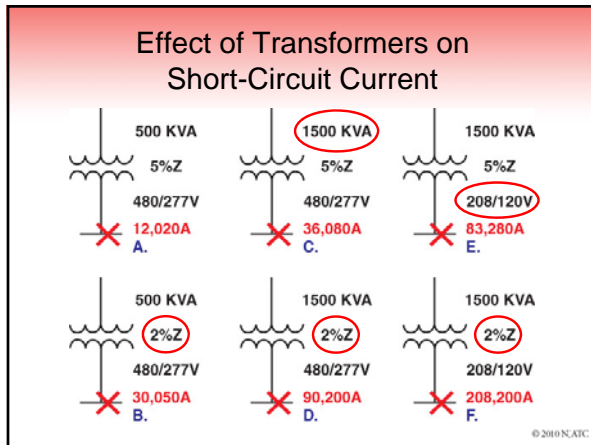
Effect of Transformers on Short-Circuit Current

500 KVA
5%Z
480/277V
12,020A
A.

500 KVA
2%Z
480/277V
30,050A
B.

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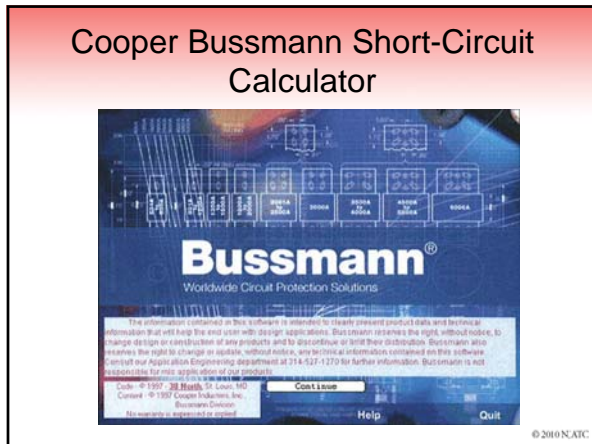


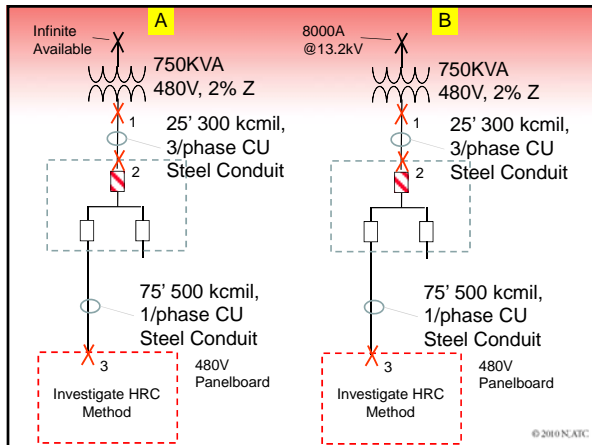


Procedures and Methods

- To determine short-circuit current at any point in system, draw one-line diagram showing all sources of short-circuit current and system component information (overcurrent devices are not considered)
- Various calculation methods available, but the point-to-point method provides a quick and reasonably accurate determination of available short-circuit current

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Determine

1. Available bolted short-circuit currents for:
 1. System A at X_3
 2. System B at X_3
2. Does A and B meet Conditions of use
3. What overcurrent protective devices meet conditions of use? (use table handout)

Handout						
Table 130.7(C)(15)(a)	Fuse Class Amp Rating		Molded Case Circuit Breaker Max. Frame†		Insulated Case CB Max. Frame†	LV Power CB Max. Frame†
Conditions of Use Type Equipment, Voltage, Parameters, AFB	Fuse UL Class	Max. Amp Rating	Non-Current- Limiting Largest Frame	Current- Limiting‡		
Panelboards or other equipment rated > 240 V and up to 600 V Parameters: Maximum of 15 kA short circuit current available; maximum of 0.03 sec. (2 cycle) fault clearing time; minimum 18 in. working distance Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 30 in.	J (LPJ or JKS) RK1 (LPS-RK) RK5 (FRS-R) L (KRP-C)	600A* 600A* 600A* 1600A	1200A	600A	None	None

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