ES&H Coordinator's Meeting

Electrical Update Talk

February 16, 2008

Calculated Arc-Flash labels

Electrical Lockout/Tagout

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Calculated Arc-Flash Labels

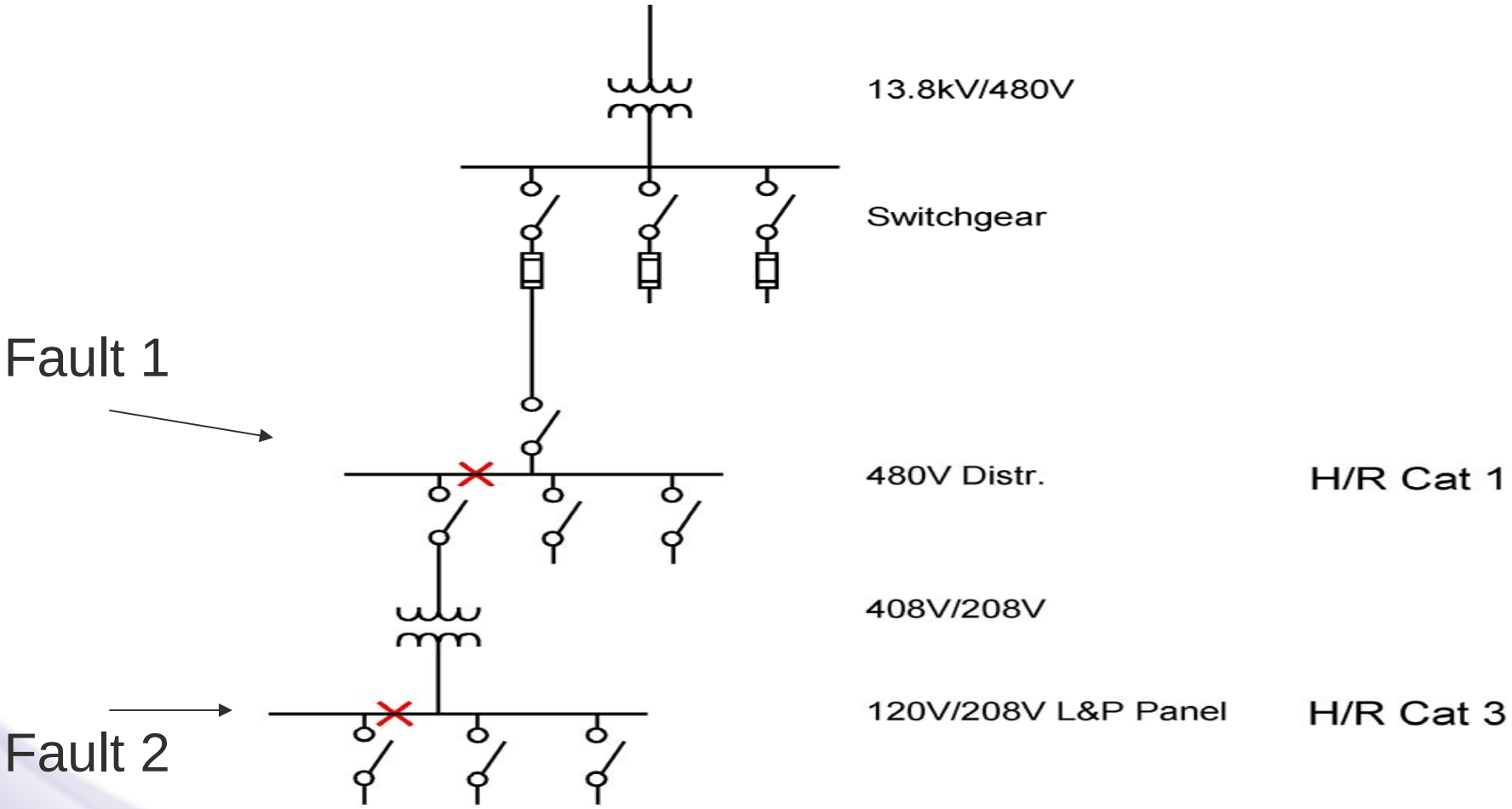
There have been comments and questions about the new Arc-flash labels – some of them don't seem to make sense:

480 V panel = Haz/Risk Cat. 1

And a panel feed from above

208 V L & P panel = Haz/Risk Cat. 3

Schematic for Calculation



Calculated Arc-Flash Labels

- Overview
  - The Hazard/Risk Category of electrical equipment is calculated by performing a Flash Hazard Analysis using the formula (simplified for clarity):

$$E = \frac{t \times F}{D}$$

E = Maximum open arc incident energy, cal/cm^2

D = distance from arc electrodes, (18 in.)

t = arc duration, seconds

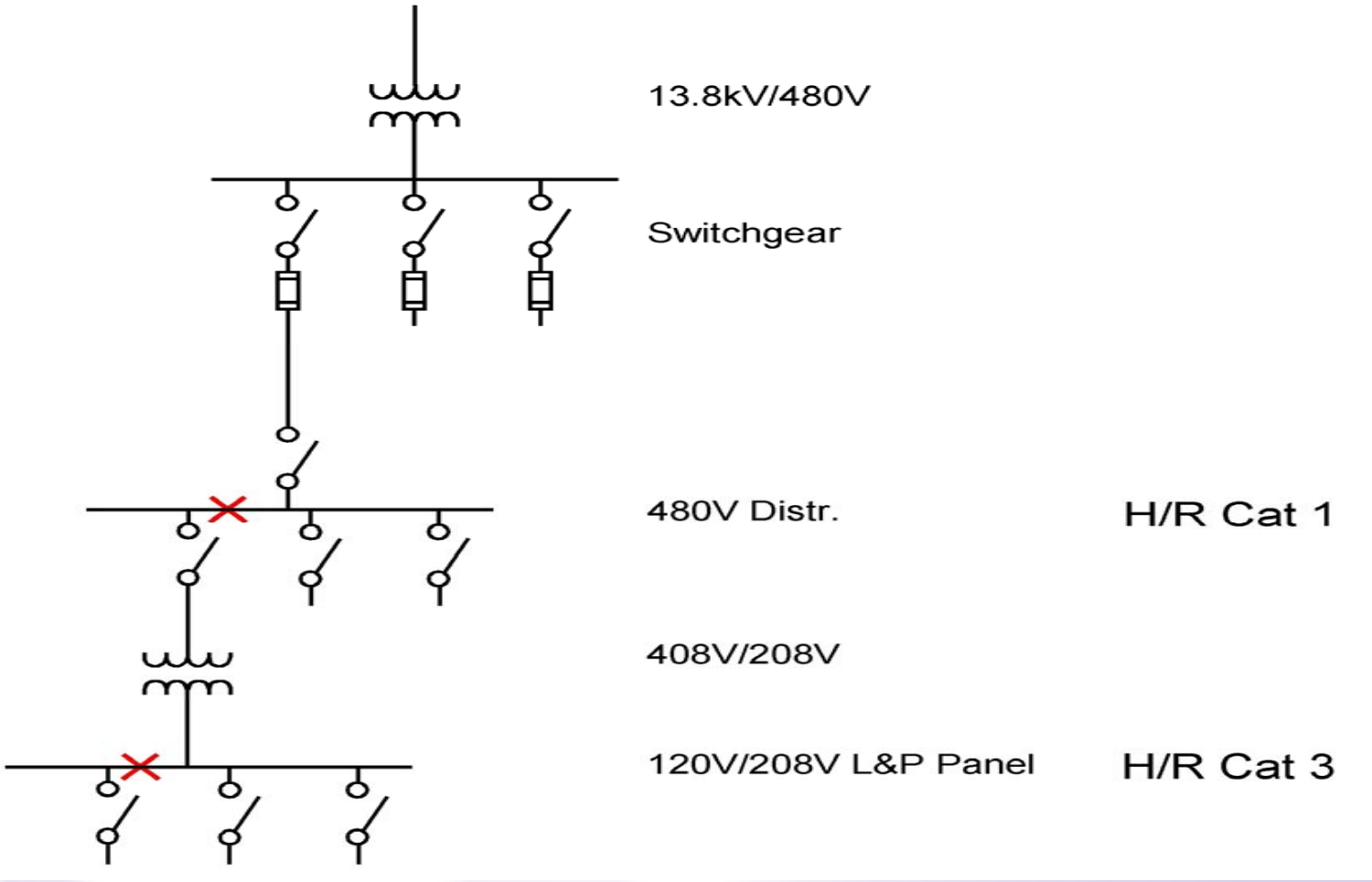
F = Short circuit current (calculated using all impedances and asymetrical currents from coordination study)

Calculation for first fault

(not real numbers, there are constants for conversion and F is calculated from MVA_{bf})

- $E = \frac{t \times F}{D}$
  - D = 18in (arm length)
  - T = 0.0004 sec (clearing time for fast acting fuse)
  - F = 17,550 Amps
- $E = 3.9\ cal/cm^2$ = H/R Cat. 1

Schematic for Calculation



Calculation for second fault
(not real numbers)

The resistance to the second fault increased, so the fault current decreases.

- $E = \frac{t \times F}{D}$
  - D = 18 in
  - T = 0.1 sec (clearing time for circuit breaker = 6 cycles)
  - F = 4500 Amps

- $E = 25\ cal/cm^2$ = H/R Cat. 3

Calculated Arc-Flash Labels

Things to Remember

- Calculation is for covers off, worker 18” from fault
- With covers “on”, in good shape, and all hardware attached, you can use the “minus 1” rule for operating (the cover does mitigate some energy in a fault)

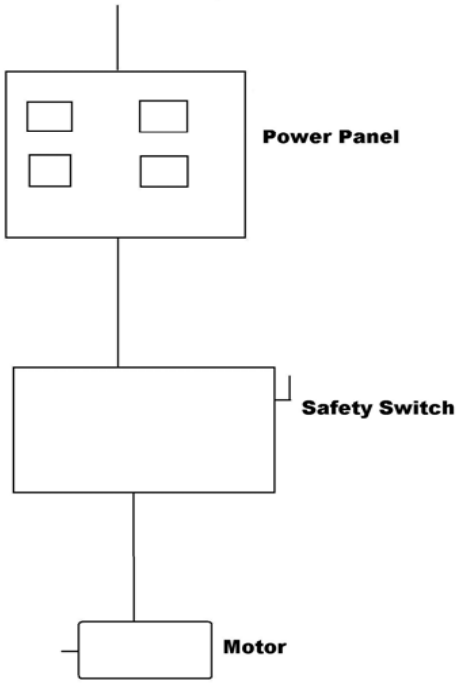
Lockout/Tagout is Required to work on Energized Electrical Equipment

- To disconnect wire at load side of Safety Switch

- We have to

Deenergize at

Upstream device



Lockout/Tagout is Required to work on Energized Electrical Equipment

- How does this affect you
  - To run new wiring into circuit breaker panel – Electrician must de-energize panel.
  - To install or remove wires from circuit breakers – shutdown panel.

- Only alternative is Specific Electrical Energized Work Permit – signed by Division Manager/ Department Head
- Electricians required to leave equipment compliant with National Electrical Code or NFPA 70E, can not leave conductors hanging in the breeze.