

For Clarification purposes “Electrical Hazards Related to Electromagnets in Accelerators”,

Ref: 29 CFR1910.333:

“Live parts that operate @ less than than 50 volts to Ground need not be deenergized if there will be no increased exposure to electrical burns or to explosion due to electrical arcs”.

Electrical Hazards due to electromagnets are classified as either Class A or Class B. Class B electrical hazards are defined as those which have one or more of the following:

- 1) 1) Terminal voltages greater than 30 Volts AC RMS or 50 Volts DC, line-to-Ground.
- 2) 2) Power limits greater than 1000VA @ voltages equal to or greater than 30 Volts DC.
- 3) 3) Stored Energy in the circuit greater than 10 Joules @ 100 Volts or more.

When any of these conditions are present, terminals must be covered or power supplies must be interlocked with the PPS so that they are off during entry.

Reference Document DOE/EV-0051/1, Electrical Safety Criteria for Research and Development Activities.

Futher note:

Electrical Hazards in our machine here will generally be defined as:

DC Magnets:

- 1) Bending Magnets
- 2) Focusing Magnets
- 3) Steering Magnets (some)

Pulsed Magnets:

- 1) Kickers
- 2) Pulsed bends....

As for 50 volts, see 110-27 of the NEC/NFPA, regarding Guarding of Live Parts. The mention is after 50 Volts only.

I want to also define Flashover: A disruptive discharge through the air, around or over the surface of insulation, or between parts of different potential or polarity produced by the application of voltage. A SHORT CAN PRODUCE A FLASHOVER.

As far as design and installation goes, Equipment DOES NOT have to be UL Approved, but it SHOULD BE in accordance with NEC, OSHA, DOE and SNS Safety Guidelines. I threw the SNS Part in, but if you look @ DOE/ EV-0051-1 Page II-4 C, Electrical Safety criteria for Research and Development Activities you will see under CODES, STANDARDS AND CRITERIA, That in no instance, is Underwriters mentioned at all.

Safety should be considered an integral part of our design process. Protective devices, Warning signs, and administrative procedures are supplements to good design, but can never fully compensate for its absence. Completed designs should provide for safe maintenance, Etc.