



BTeV Engineering Note

***** DRAFT *****

Date: 20 November, 1995

Rev Date: 17 September, 1999

Project: BTeV General Support

Doc. No: Hance-H951120A

Subject: Notice to all BTeV collaborators -- Documentation Requirements for Electrical Safety Review

You must submit all electrical apparatus being installed in BTeV to a review by the BTeV Electrical Safety Review Committee. The review must be conducted before you leave the equipment energized and unattended. You must provide the committee with documentation described below **BEFORE** they will proceed with the review.

The BTeV Electrical Safety Review Committee contact person is: _____.

Number of copies required: 3

1. **You** must provide a cover page listing a description of the equipment and name, phone number, and EMAIL address of the equipment contact person.
2. **You** must provide a sketch of the **floor plan** showing locations of racks, equipment and etc. such that reviewers unfamiliar with the experiment can locate all relevant equipment.
3. **You** must provide a **written description** of relevant equipment systems describing racks, cooling, power, interconnects and etc. Your description must be of sufficient detail such that the reviewers can verify that you have observed good systems engineering practices.
4. **You** must provide **line sketches** of all relevant DC power systems. Your sketches must include sufficient detail that the reviewers can determine that proper fusing, wire sizes, wire insulation, wire termination, etc., have been used.
5. **You** must provide **block diagram sketches** of all relevant **safety systems**. Your sketches must include sufficient detail such that reviewers can verify that you have adequately considered all reasonable safety concerns. Protection against fire and shock hazards are among the reasonable safety concerns.

The review committee will refer to the "Electrical Design Standards for Electronics to be Used in Experiment Apparatus at Fermilab" Rev 6.0 or higher. Copies of this document is available at the following URL:

You might use the "Electrical Safety Review Checklist" attached to this document to help ensure that you are ready for an electrical safety review.

Electrical Safety Review Checklist:

Documents:

- Cover page prepared with a brief description of equipment, name, phone number, and EMAIL address of the person who can answer technical questions about the equipment.
- Sketch prepared of floor plan to show reviewers where equipment is to be installed.
- Written description prepared for equipment describing racks, cooling, power supplies, and interconnects.
- Line sketches prepared for DC power systems including maximum power supply outputs, fuses, conductor sizes, conductor insulation rating (volts, temp, flame rating), and power connector ratings (amps).
- Block diagram sketches prepared for safety systems if implemented (smoke detector, water detector, airflow detector, etc.).

Electrical Safety Concerns:

- Power conductors **must** be appropriately sized to carry the maximum current available to them (see guidelines document).
- Power conductors **must** have insulation that is rated for 90°C or higher. This includes exposed buses.
- Power **and** signal cables **should** be fire rated to resist flame spread ie. cable type CL2 or better, fire rating VW-1 or better.
- If fuses, positive temperature coefficient devices (PTC's) or current limiting resistors are required, they **must** be placed at the source of the current ie. at the power supply for conductors, at the load for sense leads; and at the power connector for PC boards.
- All exposed AC and DC terminals **must** be fitted with adequate rigid covers.
- All power supplies **must** be secured against movement.
- All power conductors **must** be strain-relieved at the source and load as necessary.
- All AC cords and plugs on fans and power supplies **must** be in good condition.
- Most PC boards **probably** require fuses (see guidelines document).