

## PROTECTION AGAINST EXPOSED ELECTRICAL BUS

### INTRODUCTION

Electrical conductors are present in numerous applications around the Laboratory. Some are associated with typical industrial or R&D applications. Protection of individuals from the associated hazards of high voltage and/or high current that such conductors present when energized falls within the scope of, and shall be in accordance with, the requirements of the mandatory standards of Chapter 5040.

The following policy and requirements apply only to those exposed high voltage or current conductors associated with powering accelerator and/or beamline components, such as magnets, experimental area components, or such components when in test or conditioning areas. Such exposed conductors are generally referred to as "bus bar" or "bus".

It is the policy of the Laboratory that individuals be protected from any reasonably inadvertent contact with such high voltage or high current bus when energized. This chapter describes requirements for protecting personnel from the particular and unique hazards of such bus. The requirements of this chapter are not alternative to those of Chapter 5120, "Control of Hazardous Energy Sources for Personnel Safety (Lockout/Tagout)", which relate to the conduct of servicing, maintenance, or modification activities. Adherence to Chapter 5120 offers protection to personnel performing such activities on or near electrical bus, while adherence this chapter's requirements offers protection to all personnel in proximity to such bus.

### DEFINITIONS

Access Control - Various means, including controlled keys, interlocks, Kirk™ type key transfer systems, signs, barriers, and administrative procedures that limit access to an area to certain individuals.

Access Controlled Areas - areas which are normally locked and have some type of access control. Access is normally limited to individuals who are authorized, trained, qualified, or escorted for entry and are aware of the particular hazards that the area presents. Examples of access controlled areas include accelerator enclosures and certain permanent test stand areas.

Electrical Interlock System - a system by which power to energized electrical utilization equipment is removed or disconnected in whole or part upon some external physical event or occurrence. An Electrical Interlock System, as referred to in

this Chapter, is separate and distinct from the concept and requirements of a Radiation Safety Interlock System, as described in the Fermilab Radiological Control Manual.

High Current Bus - any exposed conductor connected to a power source capable of delivering a current of 100 amps or more to accelerator, beamline, experimental area components, or such components when in test or conditioning areas.

High Voltage Bus - any exposed conductor connected to a power source capable of delivering a voltage of 1000 volts or more and with a designed or rated output power greater than 50 volt-amperes to accelerator, beamline, experimental area components, or such components when in test or conditioning areas.

Open Access Areas - areas which are not locked or locked areas which do not have access control. Access is readily permitted to individuals who are not specifically aware of or are not trained or otherwise qualified to deal with area hazards. Examples of open access areas include accelerator and beam line service buildings, equipment galleries, and lab areas. Test areas of limited duration are often established in open access areas.

## **REQUIREMENTS**

1. Exposed high voltage or high current bus shall be protected from accidental approach or contact by persons or objects.
  - a. In open access areas, protection shall be accomplished by providing physical barriers to approach and contact such as insulation, guards, covers, enclosures, screens, platforms, or other suitable physical protection. Warning signage and/or flashing lights may also be selectively employed if judged appropriate. These requirements apply to temporary test areas having exposed high voltage or high current bus.
  - b. In access controlled areas, protection shall be accomplished by providing:
    - (i) Physical barriers to approach and contact such as insulation, guards, covers, enclosures, screens, platforms, or other suitable physical protection, equivalent to that required for open access areas; OR
    - (ii) Interlocked entrances where, upon entrance or approach to the area, the interlock system shall de-energize or trip the power source for any exposed high voltage or high current bus; OR
    - (iii) For electrical test or temporary areas without interlocked entrances (less desired), positive de-energization of the power source for any exposed high voltage or high current bus prior to entrance to the area

and locking out the power source by configuration control locks or other equivalent means. Implementation of this means of protection shall be approved by the Division/Section Head and the Senior Safety Officer responsible for the area.

2. The electrical interlock system required by 1.b (ii) above shall be bypassed only in accordance with written procedures approved by the Division/Section Head and the Senior Safety Officer responsible for the area.
3. The presence of an electrical interlock system does NOT reduce or replace the requirements of Chapter 5040, "Fermilab Electrical Safety Program", or Chapter 5120, "Control of Hazardous Energy Sources for Personnel Safety (Lockout/Tagout)", when specific work is to be performed on the power source (power supply) feeding the bus or work on or near the bus or load(s) attached to the bus.