FESHM 9140: PROTECTION AGAINST EXPOSED ELECTRICAL BUS

Revision History

Author	Description of Change	Revision Date
Dave Mertz	1. Changed Division / Section / Center to Division / Section / Project 2. Updated document format to match current template 3. Added note on personnel thresholds to definitions 4. Changed terms *Access Controlled Areas* and *Open Access Areas* to *Entry Controlled Areas* and *Open Entry Areas* to limit potential for confusion with FRCM terms and added explanatory note.	November 2020
Dave Mertz	1. Changed Senior Safety Officer to Division Safety Officer 2. Updated document format to match current template	November 2015
Mike Utes	1. Changed Division/Section to Division/Section/Center 2. Corrected the name of Chapter 2100 3. Added the link for the Radiological Control Manual 4. Minor editorial corrections	December 2010

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1.0 INTRODUCTION

Electrical conductors are present in numerous applications around the Laboratory. Some are associated with typical industrial or research & development 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 9100, *Fermilab Electrical Safety Program*

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 alternatives to those of Chapter 2100, *Fermilab Energy Control Program (Lockout/Tagout)*, which deals with servicing, maintenance, or modification activities. Adherence to Chapter 2100 offers protection to personnel performing such activities on or near an electrical bus, while adherence to this chapter's requirements offers protection to all personnel in proximity to such bus.

2.0 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.

Entry Controlled Areas - areas which are normally locked or interlocked or have an equivalent type of access control that precludes entry by individuals who are not specifically aware of, trained, or otherwise qualified to avoid or mitigate exposed electrical bus hazards.

Note: This definition is specific to this FESHM Chapter and does not correspond to or alter Controlled Area as defined in the FRCM Article 232 or the Controlled Access condition as defined in FRCM Article 337.

Note: Entry 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 entry-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.

Note: 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. http://esh.fnal.gov/xms/FRCM

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

High Voltage Bus (see note below) - any exposed conductor connected to a power source capable of delivering a potential 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 Entry Areas - areas which are not locked, or locked areas which do not have entry control that effectively deters entry by individuals who are not specifically aware of, trained, or otherwise qualified to avoid or mitigate exposed electrical bus hazards.

Examples of open entry areas include accelerator and beam line service buildings, equipment galleries, and lab areas. Test areas of limited duration are often established in open entry areas.

Note: The threshold values identified in definitions of High Current Bus and High Voltage Bus are used only to determine to which electrical conductors the requirements of this chapter apply and are not applicable to determining threshold values for personnel exposure. Those thresholds are found in Chapter 9100.

3.0 REQUIREMENTS

1. Exposed high voltage or high current bus shall be protected from accidental approach or contact by persons or objects.

    a. In open entry 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 entry-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 entry 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/Project Head and the Division 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/Project Head and the Division Safety Officer having jurisdiction over the area.

3. The presence of an electrical interlock system does NOT reduce or replace the requirements of Chapter 9100 or Chapter 2100 when specific work is to be performed on the power source (power supply) feeding the bus or work is to be performed on or near the bus or load(s) attached to the bus.