

Fermilab Test Beam Facility (FTBF) Hazard Awareness Training Handout

[PDFTBF01/CB/01]

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Overview

This document is intended to inform you of some of the more common hazards encountered at the Fermilab Test Beam Facility (FTBF). Please read the entire document and complete the [online quiz](#). This basic hazard awareness training is required for all personnel who intend to work at FTBF. It is valid for two years.

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1. Introduction

This training document outlines hazards specific to FTBF. “FTBF” consists of the Meson Detector Building (MDB) West, including MT6.1, ME6.2, and MC7 enclosures. The goal of this training is to advise you of potential hazards and the proper precautions to take to prevent unsafe situations. Untrained individuals must be escorted while in FTBF.

If you find a situation in which you need advice, training, review or a decision in regards to safety or safe operations, you should first go to your immediate supervisor. If you and your supervisor conclude that the matter goes beyond your own group, that you need assistance in resolving it, or that you need to arrange for safety training, you should contact the FTBF Coordinator. If you are unable to reach the FTBF Coordinator, you should reference the contact list posted near each of the doors in the facility. In the event of an emergency, you should call ext. 3131 from any Fermilab telephone.

Consult the FTBF Emergency Call List for the individuals listed above. This list is available at <http://ftbf.fnal.gov/contacts/>.

Environmental Safety, Health & Quality (ESH&Q) materials referenced in this document can be consulted for guidance on ESH&Q issues. These materials can be found on-line at <http://esh.fnal.gov/xms/>

1.1. Programs for Controlling Hazards

The programs for controlling the hazards that may be found within the facilities generally have three parts: (1) reviews to minimize hazards of new systems; (2) personnel training; and (3) documented operating and safety procedures or guidelines to follow. In addition, work activities performed by Fermilab employees shall be reviewed via a Hazard Analysis (HA) before work is started (see Fermilab Environmental, Safety and Health Manual (FESHM) 2060 Work Planning and Hazard Analysis). Reviews to minimize hazards in the design, construction, and operation of new systems are conducted by specific review committees or Environmental, Safety, Health & Quality (ESH&Q) personnel. If you are involved in an operation that you feel should be reviewed, contact your supervisor or the facility coordinator/spokesperson. Training courses are conducted by supervisors, the Particle Physics Division (PPD) Division Safety Officer (DSO), or the Fermilab ESH&Q Section, depending on the specific need. Written procedures and job hazard analyses are usually developed by those doing the work and their supervisors, in consultation with ESH&Q personnel when necessary.

2. Hazardous Energy

Many components utilize potentially dangerous high voltages and/or currents. In addition, certain electrical devices/components may retain significant electric charge after their high-voltage sources are removed. These sources of energy can cause electric shock to personnel if work on these devices is carried out improperly. All personnel are required to have [Electrical Safety Orientation \[FN000387\] Training](#), which is a brief orientation to the Fermilab Lockout/Tagout (LOTO) program and NFPA-70E for unqualified workers.

A common hazard is “daisy-chaining” of extension cords and power strips. Extension cords and power strips are designed to be used individually and not connected to others in series. Such improper installations can become a fire hazard by creating an over-current condition. Figure 1 shows examples of acceptable and unacceptable usages of extension cords and power strips. These are examples of configurations found onsite at Fermilab, however acceptable and unacceptable configurations are not limited to these examples. Contact the building manager if you have any questions.

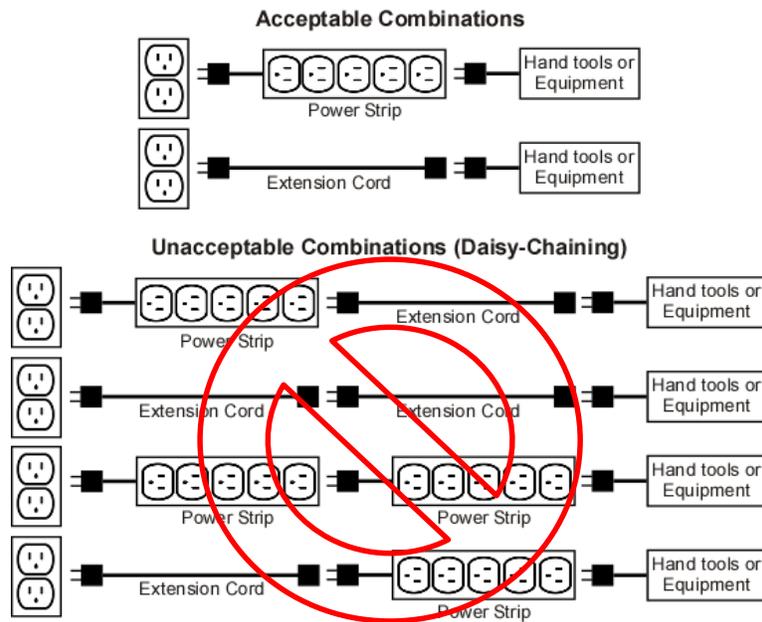


Figure 1. Examples of Acceptable and Unacceptable Combinations of Extension Cords and Power Strips.

People performing service or maintenance work on or near equipment that could cause them injury if it were to become energized must lockout and tagout that equipment's energy source(s) and must have current [Fermilab LOTO Level 2 \[FN000212\] Training](#). Only LOTO Level 2 trained personnel are authorized to work on equipment that could become hazardous to them if that equipment were unexpectedly energized. LOTO requires the use of a designated red lock and a DANGER tag to isolate the hazardous stored energy source (e.g., electricity, gravity, springs). Additional information about LOTO can be found in FESHM 2100 Fermilab Energy Control Program (Lockout/Tagout).

NOTE: The term "configuration control" applies to the lockout and tagging of equipment to control the state or operation of equipment or systems where individuals are not actively engaged in servicing or maintenance. The application of "configuration control" locks should be implemented with a (non-red) padlock and a CAUTION tag. Configuration control locks and/or tags are applied by persons or groups authorized by line management, and are typically removed by the same person or group who applied the devices. (See the Appendix of [FESHM Chapter 2100](#) for further details and examples of Configuration Control.)

Specific Hazardous Energy at the FTBF:

The FTBF area is very dynamic. As such, the electrical hazards change with each experimental set-up. Please check with the FTBF Coordinator for the hazards that are present.

3. Radiation Hazards

A facility may contain areas where radiation hazards can be found. Radiation fields can also be found near activated objects and radioactive sources. The ALARA (As Low As Reasonably Achievable) concept is used to keep doses to radiation workers at a minimum. Certain training and dosimetry requirements are also put in place to help keep doses ALARA. See below for specific requirements.

Specific Radiation Hazards at the FTBF:

This facility is posted as a Controlled Area and a Radioactive Material Area.

At a minimum, [General Employee Radiation Training \(GERT\) \[FN000241\]](#) is required to enter the facility. If work needs to be performed during a controlled access, [Radiological Worker – Classroom \[FN000470\]](#), [Radiological Worker – Practical Factors \[FN000471\]](#), and [Controlled Access \[FN000311\]](#) Training is required. If work needs to be performed with a radioactive source, [Radiological Worker – Classroom \[FN000470\]](#), [Radiological Worker – Practical Factors \[FN000471\]](#), and [Radioactive Source \[FN000048\]](#) Training is required.

Radiation dosimetry badges are not required in this facility. However, they are required when performing a controlled access, when working with a radioactive source, and/or when entering posted Radiation Areas. Temporary badges are available from the Communications Center (on the Ground Floor of Wilson Hall, ext. 4251). Badges are not transferable and may not be shared. Permanently-assigned badges are located on badge racks in the facility. Quarterly radiation dose reports can be obtained through your local RSO. Dosimetry badges must remain on Fermilab site.

All items in the beamline that are being removed during a controlled access must be surveyed with the frisker. Only personnel with current [Radiological Worker – Classroom \[FN000470\]](#) and [Radiological Worker – Practical Factors \[FN000471\]](#) can conduct surveys. ([GERT \[FN000241\]](#) does NOT allow you to perform a survey.) When an experiment is complete, equipment should be gathered and a [survey](#) must be performed by an authorized surveyor before leaving the site.

Access to all areas above the 7 foot height of the shielding blocks is prohibited during MCenter or MTest beam-on operations.

Only personnel who have current [Radiological Worker – Classroom \[FN000470\]](#), [Radiological Worker – Practical Factors \[FN000471\]](#), and [Radioactive Source Training \[FN000048\]](#) can sign out radioactive sources from the designated “source monitor”. The names of the source monitors for FTBF are posted on the radioactive source storage box.

4. Controlled Access Areas

Controlled Access is the normal mode of access during brief down-times of accelerator operation when it is expected that the beamline area interlocks will be maintained. Controlled Access is made by following the [Fermilab Controlled Access \[FN000311\] Training](#) and procedures.

Specific Controlled Access Areas at the FTBF:

Controlled access is made by following the Fermilab Controlled Access Training and procedures, along with the PPD controlled-access procedure. FTBF-specific training for Controlled Access Practical Factors and Controlled Access Leaders can be scheduled with the FTBF Coordinator.

There may be areas at FTBF posted as “NO ACCESS”. No entry to these areas should be attempted without explicit permission from the FTBF Coordinator.

5. Chemical Hazards

Small amounts of chemical materials, such as epoxies and solvents, are used or stored in certain areas. If handled incorrectly, some of these materials may become harmful. As a general practice, the use of

combustibles should be limited. All hazardous (e.g., flammable, corrosive, reactive, or toxic) materials that are not in use must be stored in specially designated cabinets. Flammable liquids, such as ethanol, must be stored in a Flammable Liquids Cabinet. Figure 2 shows an example of a Flammable Cabinet. Rags or Kim Wipes used in the application or cleanup of such solvents must be collected, disposed of in flammable rag containers and must be emptied every night.

Safety Data Sheets (SDS's) containing information on all of these and other materials within the facility can be found online at http://www-esh.fnal.gov/pls/ip/msds_search.html. Additional information regarding chemical hazard communication is outlined in FESHM 4110 Hazard Communication.

Contact a [Waste Generator](#) or [ESH&Q waste personnel](#) for information about proper disposal of hazardous or unknown chemicals.



Figure 2. Example of a Flammable Cabinet.

Specific Chemical Hazards at the FTBF:

As a general practice, the use of combustibles within FTBF should be limited. If there are questions regarding the combustibility of building materials (e.g., cables, foam board, plastics), please obtain a sample of the building material and contact the FTBF Coordinator. There is a system in place to test these materials. All combustibles, such as cardboard or wood, should be removed from the beam enclosures.

*Flashpoints: Flammable material <100F (37.8C)
Combustible material ≥100F (37.8C) to ≤200F (93.3C)*

6. Environmental Hazards

An accidental release of some materials (e.g., oil, gasoline, diesel fuel) from equipment could become harmful if it is not promptly contained. Such a release can be considered harmful if it can cause adverse effects to people or the environment. If you know or suspect that such a release has occurred or will occur, call ext. 3131 to report a spill emergency. Designated personnel are trained to execute procedures designed to minimize the spread of accidentally released materials. In addition, the following materials are prohibited from disposal in trash cans and dumpsters:

- all hazardous (e.g., flammable, corrosive, reactive, toxic) materials
- degreasing agents (e.g., Freon)
- uncured epoxy
- ethylene glycol (“anti-freeze”)
- fluorescent light bulbs
- oils
- paints
- pesticides
- radioactive material, radiation signs and labels
- scrap metal

- NiCad, lead/acid, and lithium batteries
- any free liquids (regardless of chemical nature)

Contact a [Waste Generator](#) or [ESH&Q waste personnel](#) for information regarding the proper disposal of such items. Whenever possible, please recycle rather than throw away materials that are no longer of use.

7. Hazards Associated with Operating Machinery

7.1. Cranes and Forklifts

Improper use of certain equipment, such as cranes and forklifts, can endanger people working in the area as well as material being moved. People operating cranes and forklifts must complete operator training and renew this training every three years. Operators must clear personnel from the area of the lift and warn others of approaching loads. All personnel are prohibited from the area near or under any suspended load. Personnel conducting or in the vicinity of overhead lifts or lifts that have the potential to contact the head must wear hard hats and safety shoes. Procedures for crane use can be found in FESHM 10100 Overhead Cranes and Hoists and FESHM 10140 Mobile Cranes.

Specific Hazards Associated with Cranes and Forklifts at the FTBF:

Crane operators in the FTBF high bay warn others of approaching loads by using the bell.

7.2. Tech Shop Equipment and Power Tools

Machines in this area present hazards due to moving parts. Power tool operations present similar hazards. Training is required to work with tech shop equipment. Work with some machines requires the use of Personal Protective Equipment (PPE). Any loose clothing or jewelry that might become entangled must be removed prior to operating these machines. Hair that might become entangled should be covered or tied back. All hammering, drilling, cutting, grinding, and power tool operations require the use of protective eyewear (e.g. safety glasses or goggles) with side shields that fit snugly to the face. In addition to glasses or goggles, grinding operations also require the use of a full-face shield. Some operations may require other forms of PPE (e.g., hearing protection, gloves). Manufacturer's recommended operating instructions are a good source of information on how to operate equipment safely.

Specific Hazards Associated with Tech Shop Equipment and Power Tools at the FTBF:

Prior to using tech shop equipment, workers must be trained and authorized by the FTBF technical coordinator. This includes a review and signature of the appropriate HA and limits the use to those tools specific to FTBF.

7.3. Motion Tables

Motion tables are used to position experimental equipment into and out of the path of the particle beam. These tables generally move at a slow pace, but can pose potential pinch hazards. Only personnel familiar with the operation of motion tables should operate them.

Specific Hazards Associated with Motion Tables at the FTBF:

Multiple motion tables exist within the facility for use within the beamline. See <http://ftbf.fnal.gov/motion-tables/> for additional information. No user shall operate a motion table without a briefing from FTBF staff.

8. Hazards Associated with Working at Heights

There are places throughout the facility from which people or things have the potential to fall. These include ladders, scaffolds, personnel (aerial and scissor) lifts, etc. The physical condition of ladders and scaffolds should always be inspected prior to use and must be used in accordance with all posted instructions and/or safety precautions. Personnel lifts are available in some areas for workers trained in their use. Work from elevated platforms that have no railings requires [Fall Protection Orientation \[FN000304\] Training](#), the use of a body harness and lanyard, and a written rescue plan in the hazard analysis. Hard hats must be worn whenever someone is working above you or during overhead rigging activities.

It is common for work to be conducted at elevations above floor level. When working with ladders, a number of rules apply:

- Always use the appropriate ladder for the job. Avoid reaching or leaning from a ladder to complete a task.
- When ladders are not in use, they must be stored in a secure location that will not cause an obstruction to walkways or workspaces.
- The physical condition of ladders and scaffolds should always be inspected prior to use and must be used in accordance with any posted instructions and/or safety precautions.
- Ladders are required to access cable trays. Climbing atop the concrete shielding blocks to access the cable trays is not permitted.

Specific Hazards Associated with Working at Heights at the FTBF:

Access to all areas above the 7 foot height of the shielding blocks is prohibited during MCenter or MTest beam-on operations.

All work outside of guardrails requires fall protection and a Hazard Analysis with a rescue plan.

9. Hazards Associated with Compressed Gas and Pressure Vessels

Many facilities contain systems and operations that utilize compressed gases and pressure vessels that may become hazardous if ruptured or handled improperly. All gas cylinders must be properly regulated while used and capped while stored. They also must remain protected from falling down at all times, for example by securing them to a storage rack or other solid object. Only trained personnel, with current [Fermilab Compressed Gas Training \[FN000213\]](#), should handle compressed gasses. Additional requirements and procedures regarding compressed gas systems and pressure vessels can be found in the FESHM 5000 series.

Specific Hazards Associated with Compressed Gas and Pressure Vessels at the FTBF:

Some FTBF detector systems and operations utilize compressed gases and pressure vessels that may become hazardous if ruptured or handled improperly. Please check with the FTBF Coordinator for the hazards that are present.

FTBF utilizes flammable gas systems for use in experiments. The systems are properly identified. Open flame or spark is prohibited within 10 meters of the gas systems.

10. Emergencies

Call ext. 3131 in the event of an emergency situation, such as personnel requiring medical treatment for any reason. Stay on the phone until the emergency operator indicates that s/he has all of the necessary information, including your name, location and nature of the emergency. Do not attempt to bandage another person or clean any bodily fluids from another person's injury. An Automated External Defibrillator (AED) is located just outside the doors to MTest Control Room.

When evacuating any area, proceed to the designated assembly point and wait there until the 'all clear' signal is given. If you must leave and can't wait for the 'all clear', tell your supervisor or an Emergency Warden. Rescue attempts will be made by the Fire Department if someone is unaccounted-for and believed to be in an unsafe area (e.g., burning structure, oxygen deficient area). If you notice that a fellow worker is missing during an emergency, immediately report this to an Emergency Warden, the Incident Commander (Fire Dept.) or the Fire Chief.

10.1. Fire Alarm

The fire alarm is a steady alarm that may be accompanied by a flashing strobe light. It means that smoke or fire has been detected in the area.

Specific Procedures for a Fire Alarm at the FTBF:

Leave the area via the nearest exit and go to the designated assembly point, which is across the street from the west side of the building. Fire extinguishers should be used by trained personnel only.

10.2. Sitewide Emergency Warning System (SEWS)

This is a verbal communication system broadcast throughout all areas of the laboratory. It is used to notify personnel when hazardous conditions exist and what protective actions to take. It is very important that you respond to its warning tones and messages and that you follow the transmitted instructions. If the nature of the message indicates severe weather, promptly go to the designated shelter for your area.

Specific Procedures for a SEWS Message at the FTBF:

Follow the transmitted instructions. The designated shelter areas for FTBF are the bathrooms on the west side of the building.

11. Cryogenic Hazards

There may be areas within the facility where cryogenics such as liquid nitrogen or argon may be routinely present. A leak of these materials can cause local zones of oxygen deficiency. In addition, there may be areas where acute physical hazards associated with handling cryogenic materials, such as burns to the eyes and skin, are present. When cryogenic materials are handled, appropriate PPE, such as gloves and protective eyewear with side shields, must be worn. Additional information regarding the controls and procedures required of cryogenic and ODH areas are contained in FESHM 5032 Cryogenic System Review and FESHM 4240 Oxygen Deficiency Hazards (ODH) (Work Smart Standard).

Specific Cryogenic Hazards at the FTBF:

Some FTBF detector systems and operations utilize cryogenics that may become hazardous if handled improperly. Please check with the FTBF Coordinator for the hazards that are present.

12. Miscellaneous

The following describes some additional general hazards and work rules which exist within the facilities:

- Smoking at facilities is permitted only outdoors and at least 15 ft. from the nearest indoor entrance.
- All new visitors working at Fermilab must register with the Users' Office (Wilson Hall Mezzanine, ext. 3111) upon their arrival.
- It is always preferred that people not work alone. When this is impractical, workers should at least insure that another person, such as their supervisor, is aware of when and where they are working, and they should make arrangements to periodically check-in with that person. This is especially important for work during off-hours. Also note that for some types of jobs, explicit "two-man rule" requirements may exist.
- **Nothing** must be attached to or suspended from overhead sprinkler pipes.
- Since janitorial personnel do not service some areas within the facilities, you must clean up after yourself.
- Appropriate PPE must be worn to protect against hazards.
 - Closed-toe shoes must be worn at all times within the FTBF.
- Alcoholic beverages are prohibited within FTBF.
- No food or beverages are allowed in the MT6.1, MC6.2 or MC7 areas.
- The FTBF coordinator should be notified of all tours. Anyone giving a tour must have this training and current GERT or Rad Worker training.