FOREWORD

Welcome to Fermilab, a U.S. Department of Energy research laboratory. Fermilab has no higher priority than to perform research in a safe and healthful manner. We insist that every worker, experimenter, and sub-contractor make job safety and health a top priority as well. Your involvement is key to making your work site an injury-free zone.

This handbook is provided to give you an overview of Fermilab's Environment, Safety, Health & Quality (ESH&Q) Program, which is part of an Integrated Safety Management system.

Fermilab subscribes to the philosophy of Integrated Safety Management (ISM), and expects its subcontractors and sub-tier contractors to do the same. ISM is a system for performing work safely and in an environmentally sound manner. There are 7 principles of ISM in our contract with your company:

1. *Line management, from you through your supervisor, to the president of your company, is responsible and accountable for working safely.*
2. *Your responsibilities and authorities as they apply to ESH&Q should be clear to you. Talk with your supervisor if your authority and responsibilities are unclear.*
3. *You must have the training and experience to do your job. Make sure you have the appropriate OSHA training.*
4. *Priorities are to be balanced. Being in a hurry is no reason to perform work unsafely.*
5. *Before you start work, the hazards must be evaluated and procedures established to allow you to work safely.*
6. *Procedures should be tailored to the hazards of the work you are performing. At Fermilab, this is spelled out in the hazard analysis. Ask your supervisor to show it to you. Discuss the hazard analysis with your supervisor. If you have an idea of how to do the work better and safer, bring it up.*
7. *Check that all permits, training, and hazard analysis ready and current before you start work.*

If you have questions regarding safety and health or the environment, please contact your task manager.

Fermilab has no higher priority than to perform the research in a safe and healthful manner. But nobody, other than yourself, can watch over you constantly to insure that you work safely.

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TABLE OF CONTENTS

INTRODUCTION

FERMILAB MISSION

Fermilab was established in 1972 on 6,800 acres in DuPage and Kane Counties. The laboratory's mission is to drive discovery in particle physics by building and operating world-leading accelerator and detector facilities, perform pioneering research with global partners, and transform technologies for science and industry.

POLICY AND ADMINISTRATION

FERMILAB ENVIRONMENT, SAFETY, HEALTH & QUALITY RESPONSIBILITIES

Your point of contact at Fermilab for all Environment, Safety, Health & Quality concerns relating to your job is the Task Manager, Service Coordinator, or Construction Coordinator assigned to your project. This person may also call upon a Senior Safety Officer in his/her division or section to help with any Environment, Safety, Health & Quality concerns you may have.

The Environment, Safety, Health & Quality (ESH&Q) Section is responsible for oversight of the Laboratory ESH&Q program and is available for technical support, special services, and consultation.

SUB-CONTRACTOR COMPANY RESPONSIBILITIES

Fermilab subcontractors conducting work on site are required to take all precautions necessary to protect the environment, health and safety of their employees, as well as that of other persons on and around the site. In part, this requires compliance with the Fermilab ESH&Q Manual and this ESH&Q Handbook, the Illinois Rules of the Road and all DOE mandatory Environment, Safety & Health standards, especially OSHA, National Electrical Code (NEC) and National Fire Prevention Association (NFPA) standards prescribed by DOE.

Subcontractors must provide any necessary Environment, Safety & Health training, medical surveillance, PPE, and other safety equipment required to perform your work. In cases where the potential hazards are not inherent to the subcontracted work activity, but rather a part of Fermilab activities (i.e., custodial subcontractors in radiation or ODH areas), the Laboratory may provide the appropriate training, medical surveillance, and safety equipment.

YOUR ENVIRONMENT, SAFETY, HEALTH & QUALITY RESPONSIBILITIES

You are responsible for the safety aspects of your activities and for following all Environment, Safety, Health & Quality procedures applicable to your work. If you become aware of conditions or behaviors that may be safety violations, it is your responsibility to report such violations to your supervisor, task manager, or construction coordinator. If you believe an assigned task to be a hazard to the environment, or safety and/or health you should request a pre-performance review. Such a request will NOT be cause for disciplinary action.

After completing sub-contractor orientation you will be issued a card with your name and the date of the training. DO NOT LOSE THIS CARD. You may be asked to produce it at any time while on site. If you do not have the card you will attend this training again.

GENERAL INFORMATION

EMERGENCY ACTIONS

In any emergency, dial x**3131** from any Laboratory phone; from a mobile phone dial **630-840-3131**. Be prepared to give the Emergency Operator the following information:

- The nature of the emergency
- The location
- Your name
- Other information the operator may require

and remember to STAY ON THE LINE until the operator indicates that no more information is required and that help is on the way:

You should become familiar with the alarms used on site. Ask your supervisor, spokesperson, or Task Manager for emergency evacuation and tornado shelter information.

ALARM SOUNDS

Location	Emergency	Sound	Actions
Indoors	Fire	Steady alarm	Exit building & meet at designated assembly point.
Indoors	Tornado or severe weather	Voice instructions	Go to designated shelter area.
Indoors	Hazardous atmosphere*	Whooper alarm	Evacuate the area.
Indoors	Other emergency	Voice instructions	Follow voice instructions
Outdoors	Tornado or severe weather	Steady siren	Go to designated shelter area.
Outdoors	National emergency	Warbling siren	Go to designated shelter area.

**Includes ODH and radiation.*

HAZARD WARNING LIGHTS

COLOR	CONDITION	Action or status
Red	DANGER	Stop, Do not enter, or Do not touch.
Yellow or orange	CAUTION	Some hazard is present.

HAZARD ANALYSIS

The objective of hazard analysis is to develop an understanding of the potential for the hazard to affect the health and safety of the worker, the public, and the environment. The analysis includes three steps: 1) identifying the steps of the work activity; 2) identifying the hazards associated with the work; and 3) identifying the precautions needed to avoid injury.

Due to your job knowledge, you may be required to take part in a hazard analysis. If a written hazard analysis is prepared for your job you must review it before starting work, and you must follow the steps in the analysis.

STOP WORK PROCESS

Any Fermilab employee may stop your work if they believe your actions pose an imminent threat to the safety and health of individuals or to the quality of the environment. You must comply with the request to stop work. Your activity may resume after the hazard has been abated. Disagreements shall be rapidly escalated up through management chains.

ACCIDENTS AND ILLNESSES

All injuries, no matter how small, must receive medical attention. In the event a serious injury or illness occurs onsite, dial **x3131** for immediate medical assistance.

Occupationally incurred injuries and illnesses must be reported to your Fermilab point of contact at the first opportunity. Accident reports will need to be completed.

TRAFFIC SAFETY

Fermilab traffic regulations conform to those of the State of Illinois as prescribed in *Rules of the Road*. For your safety and everyone else working on or visiting the site, pay attention to your driving. Some items to remember:

- Site-wide ***MAXIMUM*** speed limit is 40 m.p.h., lower in certain areas.
- Most traffic accidents on site involve deer. Be especially watchful in the fall, and all year at dawn and dusk. These are the times deer are most active and moving across the site.
- Pedestrians have the right of way. **Yield to anyone in a crosswalk**.
- Bicyclists can be found in all areas of Fermilab. Be watchful of bicyclists on roadways and in areas where bikepaths cross roads.
- Cell phones and other devices create a distraction and cannot be used while driving. Park the vehicle to use cell phones and other devices.

Disabled Vehicles: If your vehicle becomes disabled, make every attempt to clear the roadway and notify Security (x3414) immediately to avoid creating a traffic hazard.

In Case of Accident: Anyone involved in a motor vehicle accident on the Laboratory site is required to notify Security immediately (**x3414**). If there is personal injury as a result of the accident, dial **x3131** to summon emergency help.

FIRE SAFETY

You can help prevent fires by following these rules:

- Maintain a neat and clean work area. Preventing rubbish and other combustible materials from accumulating. Don't hoard boxes or crates; instead store them in specified storage areas or, better yet, recycle them. Store flammable and combustible materials in approved containers.
- Before starting any operation involving welding, brazing, or flame cutting, obtain a "Burn Permit" by calling the Fermilab Fire Department at x3428.
- Observe all "No Smoking" signs.
- No smoking is allowed in ANY buildings at Fermilab.
- Keep flammable and combustible materials at least 18 inches away from appliances such as coffee makers, hot plates, space heaters, and other sources of ignition.

If you see or smell a fire:
- Go to a safe place.
- If you pass a fire alarm box, pull the alarm.
- Call x3131 to report the fire.
- Do NOT attempt to use a portable fire extinguisher unless you have been trained to do so by the Fermilab Fire Department.

BLOODBORNE PATHOGENS

Human Immunodeficiency Virus (HIV) and Hepatitis B Virus (HBV) are normally transmitted through contact with blood or other body fluids from an infected person. Normally this occurs by sexual contact, shared drug needles, and sticks from used needles, etc. They are not transmitted by coughing or sneezing, by touching an infected person, or even by using the same equipment, facilities, showers, toilets, etc. To protect yourself against HIV and HBV, avoid direct contact or exposure to infectious blood or body fluids. Do not attempt to clean up other people's blood or other potentially infectious materials unless you have been trained to do so.

The most common scenario at the Laboratory is when workers are injured by cutting or puncturing themselves and blood drips onto the floor or equipment. When possible the injured worker should clean up the blood or body fluid. This eliminates the risk of infection for others and no training is required to do this. If the injury is severe, or the people cannot clean up the spill themselves, call **x3131**.

EMPLOYEE CONCERNS

Complaints regarding environment, safety, health or quality concerns, either informally or formally, may be made to the Fermilab ESH&Q Section by calling x3511.

LAB CLOSINGS

If you want to know if the Laboratory is closed due to inclement weather or some physical condition (power outage, storm damage, etc.) information is available through the following sources:

Radio		Television	
		CBS	Ch. 2
WGN	720 AM	WGN	Ch. 9
WBBM	780 AM	FOX-TV	Ch. 32

In the event of severe weather, i.e. blizzard, heavy snow accumulations, flooding, etc., there will be a message as to the status of the Lab on our website: www.fnal.gov

INDUSTRIAL SAFETY

RADIATION SAFETY

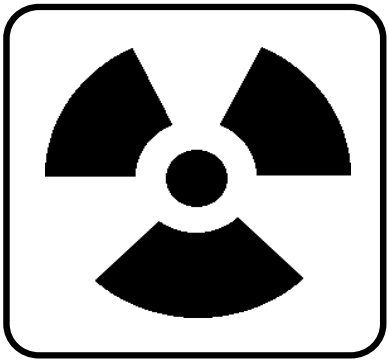
There are areas at Fermilab where exposure to man-made radiation can occur. These areas, designated as CONTROLLED AREA, RADIOACTIVE MATERIAL AREA, RADIATION AREA, HIGH RADIATION AREA, and VERY HIGH RADIATION AREA are posted with black (or magenta) and yellow signs indicating their boundaries.

Some areas of the Laboratory contain removable radioactivity, typically in the form of radioactive dust, rust, or grease, which could be picked up on shoes, hands, or clothing. Such areas are posted as CONTAMINATION AREAS. Contact a Radiation Safety Officer (RSO) or the ESH&Q Section (x5811) for information on the training necessary to enter specific areas or work with specific materials. The minimum training required for entry into areas posted with the radiation symbol is General Employee Radiation Training (GERT). Entry into some radiological areas requires more in-depth radiological worker training. Some radiological areas require individuals to wear a radiation monitoring badge to measure the radiation received. Instruction on how to procure such a badge and how to properly wear it is incorporated into the special training for radiation workers.

Some areas, such as experimental enclosures or target areas are kept locked. When the accelerator is operating, the radiation levels in these areas may be high enough to cause serious injury or even death. DO NOT ATTEMPT TO CIRCUMVENT THIS SECURITY SYSTEM.

Call x3131 to report all incidents/accidents involving radiation.

RADIATION SYMBOL



WASTE DISPOSAL

Never put hazardous, radioactive, or, special non-hazardous waste materials into trash receptacles or dumpsters. Whenever possible, **non**-hazardous, **non**-radioactive liquid waste should be disposed of in the sanitary sewer - NEVER in surface water. Check with your Fermilab point of contact, Senior Safety Officer or ESH&Q Section before disposing of any waste. Ignoring these prohibitions is a violation of state and federal regulations, which can result in serious environmental damage, expensive remediation, civil penalties, and criminal prosecution.

CHEMICAL HAZARDS

Before working with any chemical at Fermilab:

- Chemicals must be approved by your Fermilab point of contact.
- Your employer must train you on the proper use of that specific chemical.
- Read the Globally Harmonized System Safety Data Sheet (GHS-SDS) that outlines the hazards, handling procedures, and emergency actions for that chemical.
- Wear the required personal protective equipment to reduce your exposure to the hazard.

Your employer is responsible to monitor your workplace for chemical hazards. If there is a spill of chemicals in your work area do not attempt to clean it up. Call **x3131** and inform them of the spill.

NOISE

In many work areas, signs requiring hearing protection are posted. ALWAYS wear hearing protection in these areas. Some people mistakenly think that they will "get used to the noise". They have been told that the human ear will "toughen up" and that the noise will not hurt. THIS IS A TOTAL MISCONCEPTION! You are not getting used to the noise, you are losing your hearing! Don't take chances; use your hearing protection.

LASER SAFETY

Lasers are employed extensively at Fermilab for alignment, as calibration sources and in holography. Radiation from Class I lasers cannot cause injury while that from Class II lasers can only damage the eye upon prolonged direct viewing. Accordingly, precautions for using these devices are minimal.

Notify your Fermilab point of contact or the ESH&Q Section before bringing lasers of Class III or higher onto Fermilab property. Class III lasers are capable of causing eye injury before an exposed person can react and Class IV lasers can cause skin injury and even diffuse reflections from such devices can cause eye injuries. A special medical exam and training are required in order to use these more hazardous lasers. Precautions include direct supervision by a qualified laser operator, warning signs, locking the laser when not in use and protective eyewear.

ELECTRICAL SAFETY

All electrical tools must be inspected before use and connected to Ground Fault Circuit Interrupter (GFCI) sockets.

Work on electrical distribution systems is performed only by qualified workers and requires an approved Electrical Work Permit. Contact your Fermilab point of contact to obtain this permit.

LOCK-OUT / TAG-OUT

Fermilab uses red locks and/or DANGER tags to safeguard personnel from energy sources during work activities. **DO NOT TOUCH**, remove, or violate these locks and/or tags; someone's life is on the line.

If you are performing Lock-out / Tag-out activities you are required to attend training and be familiar with the applicable procedures.

MAGNETIC FIELDS

Although Fermilab makes extensive use of large magnets, most do not present an exposure hazard since the fields are usually constrained to the interiors of the magnets. The most important exceptions to this are the analyzing magnets, which are used in fixed target research. When analysis magnets are energized, ferrous materials are not allowed in the vicinity of the magnets. In addition, if you have a cardiac pacemaker, metallic implants, metallic prostheses, medical electronic devices or active sickle cell anemia, contact your Fermilab point of contact. You should not work in areas where there are obvious magnetic forces on ferrous objects.

EQUIPMENT USE

Unless arranged in the contract, your employer is responsible to supply you with the necessary equipment to complete your job. You must be trained in the proper and safe use of the equipment before using it. You must also inspect the equipment before use to make sure it is in proper working condition.

LADDERS

All ladders used at Fermilab must meet the requirements set forth by the Occupation Safety & Health Administration (OSHA). Ladders must be appropriate for the job - proper length and type; e.g., metal ladders must never be used for electrical work or in areas where there is any probable contact with live electrical parts. Arrangements must be made for transporting tools and materials up and down ladders (i.e., use canvas bag or tie into bundles, etc.) so that you will have both hands free for climbing.

Misuse of ladders and the use of improvised ladders are responsible for a large percentage of the injuries resulting from falls. When a ladder is used, the following basic safe practices should be observed:

- Never use a defective ladder.
- Straight ladders shall extend at least 3 feet above the highest landing to which access is intended.
- Climb no higher than the third rung from the top of a straight ladder, or the second step from the top of a step ladder.
- Work no more than an arm's length from the upright position. A good rule is to keep your belt buckle between the ladder side rails.
- Only one person at a time shall be on a ladder.
- Select firm footing. Place the feet of a straight ladder at least 1 foot out from the vertical plane for each 4 feet of height between the base and the support.
- Remove ladders at the end of your work. Do not climb or stand on improvised ladders such as chairs, barrels, drums, desks, or boxes.
- Select the right ladder for the job.
- Before use, visually inspect your ladder for obvious defects such as cracked or damaged side rails; missing, loose, or cracked rungs; loose, bent, or broken steps or spreaders; and worn or missing shoes.

SCAFFOLDS

All scaffolds must conform to OSHA requirements. They are to be inspected and approved by a competent person prior to use. See your Fermilab point of contact for more information.
Climbing on handrails, midrails, or brace members as a means of access to the scaffold is forbidden. Use a secure ladder for entry. Fall protection is required if you are unable to erect proper guardrails or need to work from the rails. Check with your Fermilab Construction Coordinator/Task Manager to insure your work plan is appropriate.

COMPRESSED GASES

Compressed gas cylinders must be properly secured when stored, during transport, and during use. Improper storage could lead to damage to the cylinder and surrounding equipment and structures, or injury to personnel.

NEVER smoke in compressed gas storage area - hydrogen, acetylene, or oxygen storage areas. In general, compressed or liquefied gases should only be used in large well-ventilated areas. Most liquefied gases also present a hazard of frostbite.

COMPRESSED AIR

One hazard of using compressed air in proximity to the human body involves the accidental injection of air under the skin. Compressed air should never be used to clean personal attire or to direct against someone else in “horseplay”.

FERMILAB WORK PERMITS

A Fermilab Work Permit is required for all construction projects conducted on the Fermilab premises. Permits include: Confined Space Permit, Radiological Work Permit, Electrical Work Permit, Burn Permit, and Disablement Tags.

Your Fermilab point of contact is responsible to obtain a copy of all applicable permits before work begins.

CONFINED SPACES

A confined space is any enclosure for which entry and exits are limited and hazards may be present. Identifying characteristics include small opening(s) - ingress/egress is restricted, poor ventilation, infrequent access, isolation from help, and a relatively small volume. Typical confined spaces at the Lab include manholes, tanks, pipes, sump pits and Cerenkov counters. The atmosphere within a confined space may be oxygen deficient, toxic or flammable. There may also be physical hazards such as poor visibility, poor communication, poor footing, heat, radiation, rotating equipment and electrical wiring. Some confined spaces require a permit before entering. You must complete a special training course to qualify to enter these spaces. Confined spaces can be deceptively dangerous. Do NOT enter a confined space unless necessary and you have the appropriate training and monitoring.

HYDROGEN AREAS

Hydrogen is colorless, odorless, non-toxic, highly flammable and explosive in the presence of air or oxygen in the right concentration. It forms a flammable mixture when it exists at 4 to 74% in air or 4 to 94% in oxygen. If ignited, unconfined hydrogen/air mixtures usually burn, but confined mixtures can be expected to explode. While hydrogen is not toxic, it can displace the air in a confined, unventilated space and cause asphyxiation. In addition, hydrogen will tend to form pockets of gas along ceilings, which can lead to an explosion or fire hazard.

- A flashing or rotating blue light is used at the Laboratory to indicate that hydrogen is present in experimental apparatus in the area.
- **Only trained personnel may be allowed to work in hydrogen areas**. Special approval is necessary to enter these areas. If you must enter, contact your Fermilab point of contact for further instructions.
- Welding, cutting and the use of open flame for burning are PROHIBITED in hydrogen areas without the express, written authorization of a division/section safety officer and the issuance of a Welding, Cutting and Brazing Permit.
- Hydrogen areas are designated NO SMOKING areas.

CRYOGENIC SAFETY

Cryogenics involves the use of gases that become liquids at low temperatures. These include:

- Liquid Hydrogen: for targets for physics experiments and for bubble chambers.
- Liquid Argon: for detectors used for physics experiments and as a source of argon gas.
- Liquid Helium: for cooling superconducting magnet coils to the very low temperatures they require for operation.
- Liquid Nitrogen: for cooling traps in vacuum systems, for pre-cooling and shielding helium refrigerated systems, for cold shocking equipment to test its low temperature integrity, and as a source of nitrogen gas.
- Liquid Oxygen: for cutting and welding operations.

Prior approval is required before working in a cryogenic area. Contact your Fermilab point of contact for further instructions.

OXYGEN DEFICIENCY HAZARDS (ODH)

Air normally contains 21% oxygen. If the concentration at normal atmospheric pressure falls below 18%, harmful effects can occur - such as reduced senses, poor reasoning ability, dizziness, loss of consciousness and even death.

Certain operations have the potential to expose you to atmospheres that are oxygen deficient. In particular, those occurring near liquefied gas (cryogenic) systems. **To enter or work in these areas requires special medical screening and training.**

TRANSPORTING HAZARDOUS MATERIAL

Contact your Fermilab point of contact before transporting any hazardous materials.

ONSITE: Fermilab is a restricted-access site. Therefore, transportation of hazardous material on Fermilab roads is exempt from State and Federal Department of Transportation (DOT) regulations. Fermilab is committed to transporting hazardous material, including hazardous waste and hazardous substances, in a manner that ensures the protection of Laboratory personnel, the surrounding communities, and the environment.

OFFSITE: The offsite transportation of hazardous material, including hazardous waste and hazardous substances, shall be done in accordance with applicable Federal Department of Transportation regulations (49 Code of Federal Regulations).

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) is designed to protect you from obvious hazards within the working environment. There is no way of knowing when and where an accident will occur; therefore you should take the necessary precaution of protecting yourself at all times. Hard hats, safety glasses, safety shoes, gloves, face shields, etc. are passive protective devices which are designed to be worn at all times while in the presence of a hazard. This equipment will do you no good taking up space in vehicle or your locker when you should be wearing it. Personal protective equipment is one of the most important elements of the Fermilab safety program and provides you with the last barrier between you and the hazards in your work area.

Your employer is responsible for issuing the proper PPE for your job. You must know how to wear the equipment properly and you **must** wear it.

FALL PREVENTION/PROTECTION

Fermilab requires anyone working on a construction site at a height of 6 feet or more above the floor or ground to have a fall protection system in place. A general industry site would require fall protection at 4 feet or more above the floor or ground. This could include a line and harness or other protection device or system. Contact your Fermilab point of contact to determine what type of fall protection is required for your job.

EXCAVATION

There are many buried utility systems and cables on Fermilab property. Therefore, a permit is required before any excavation, digging, or trenching may start. Contact your Construction Coordinator / Task Manager before starting these operations.

BARRICADES

Many types of work involve digging, overhead hazards, or obstructions. You are required to station the proper barricades, cones, or ropes to alert people to the hazard and keep them from entering the area.