TA-53 Facility Specific Training

Course number 34095

Course materials were developed by the LANSCE Training team.

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Content for this publication is based on the training material in TA-53 Facility Specific Training (Version 3/05, Course number 34095)

TA-53 Facility Specific Training
Course Number 34095

Introduction:

This study guide can be used as a reference while taking the required quiz at the end of the web based training program. You must score at least 80% on the quiz to receive credit for TA-53 Facility Specific Training.

A guided tour of the TA-53 facilities is suggested prior to or shortly after taking this training to give you a better understanding of the layout of the facilities discussed on the following pages.

Retraining for this course is required every 24 months. Workers who are retraining are only required to go through the "Lessons Learned" section and pass the quiz.

Terminal Objective:

At the completion of the TA-53 Facility Specific Training (FST) the trainee will be able to demonstrate an understanding of the procedures for accessing TA-53 facilities, hazards present at TA-53 and the controls used to mitigate those hazards.

Enabling Objectives:

At the completion of this training the trainee will be able to:

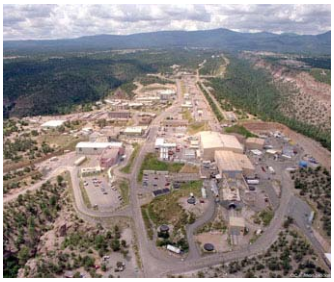
E.O.1. Describe the process for entering TA-53 when the main entrance gate is open or closed.
E.O.2. Recognize the safety chain of responsibility for at LANL.
E.O.3. Recognize stop-work responsibilities.
E.O.4. Recognize the steps involved in Integrated Work Management (IWM) at the Laboratory
E.O.5. Given a hazard, identify the associated controls at TA-53.
E.O.6. Identify the kinds of information found on hazard postings.
E.O.7. Recognize the requirements for removing anything from an area controlled for radiological purposes.
E.O.8. Recognize responsibilities associated with the generation of waste.
E.O.9. Given a scenario, select the appropriate action to take during and emergency or incident.
E.O.10. Identify the correct response to building-wide alarms, contamination alarms, or gate alarms.

TA-53 Los Alamos Neutron Science Center Facility and Its Mission

LANSCE Mission:
Deliver neutrons and protons safely and reliably for all LANSCE users. The institutional goal is to create a world-class national user facility for all program sponsors and users.

LANSCE Core Values:

• Develop a safe and secure work environment that protects our employees, visitors, collaborators as well as the confidential or classified information entrusted to us.
• Address the mission critical needs of stockpile science and stewardship using the unique experimental capabilities of LANSCE.
• Attain excellence in the basic and applied science that supports the Laboratory's mission and strategic goals.
• Achieve excellence in operating a National User Facility
• Attract, retain, and develop top scientific, engineering, technical, and administrative talent for the Laboratory through performance excellence and developing an empowering work environment.)



LANSCE is one of the largest technical areas at LANL. It covers 750 acres with over 350 buildings, and it supports groups from LANSCE, P, ISR, ESA, C and DX Divisions.
Scientists from all over the world perform research at LANSCE. LANSCE operates the most powerful proton linear accelerator (linac) in the world. The linac accelerates protons along a straight path, increasing their speed to approximately 84 percent of the speed of light.

WORK AREAS

All building numbers at TA-53 follow the prefix “MPF,” which stands for “Meson Physics Facility.” This term dates to the period between 1972 and 1997, when LANSCE was known as the Los Alamos Meson Physics Facility (LAMPF).

We group the buildings at TA-53 into four main categories by hazards and work activities. The following map shows the category for the main buildings at TA-53.

The categories include the accelerator complex, the experimental and research areas, the accelerator technology areas, and office buildings and other minimal hazard areas.

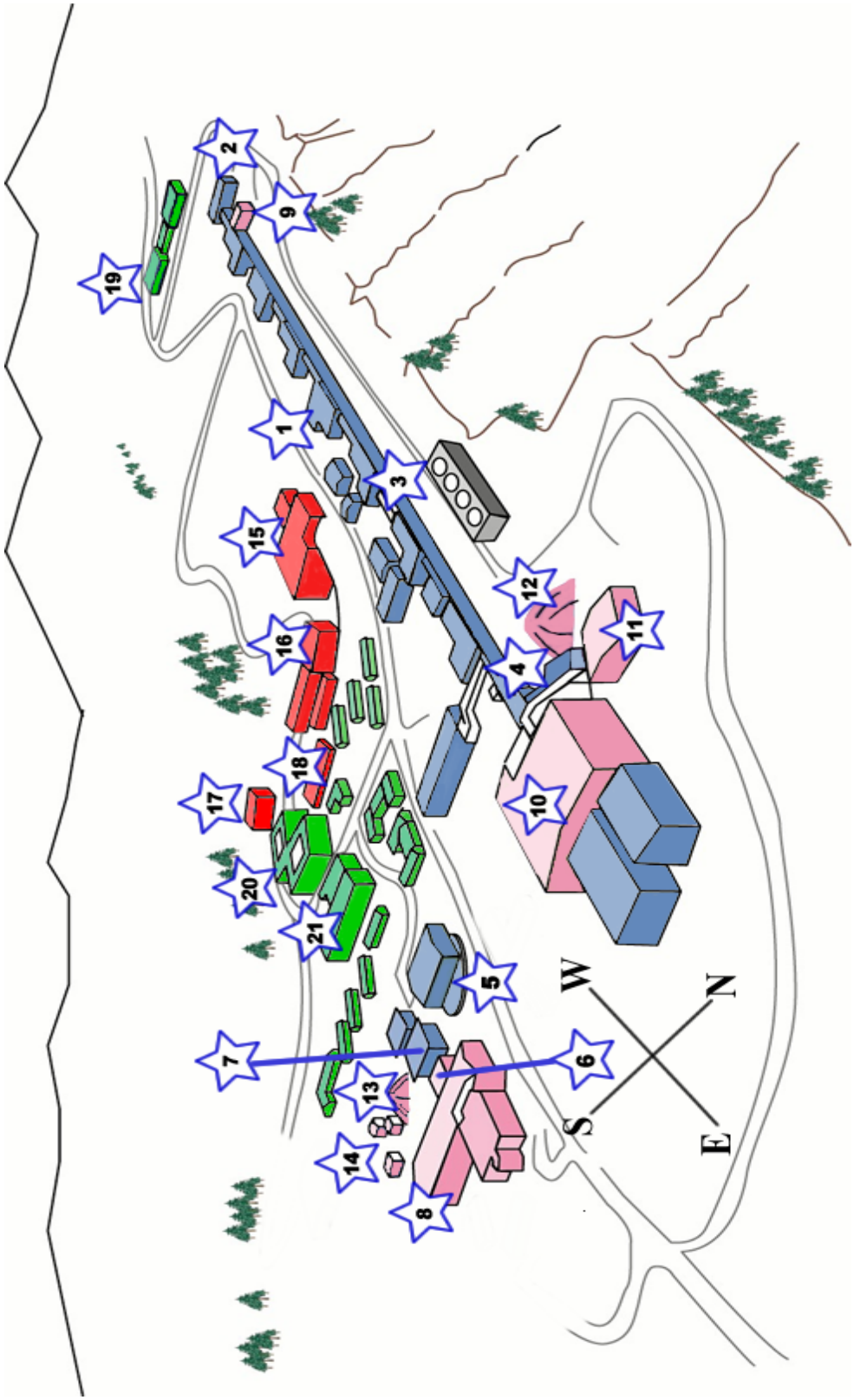
In addition to the accelerator and its experimental areas, several other facilities at TA-53, including Buildings 14, 17, 18, 19, and 365, are used for accelerator-technology development and research.

Limited Access Areas

The term Limited Access Area (LAA) at TA-53 refers to areas where access is limited for radiological safety. This term should not be confused with security Limited Access (LA) areas, where access is controlled for security concerns.

When the primary beam is being delivered to WNR, ER-1, the Mechanical Equipment Building (MEB), and the Cryogenic Systems Area (CSA) become Limited Access Areas (LAA). In the highly unlikely event of a prolonged beam spill, workers in these areas could potentially be exposed to elevated radiation levels. Entry is controlled by means of a badge reader system.

If you need to access an LAA, you must receive additional training and be added to the appropriate Authorization Access list for the badge reader that controls entry to the area.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The map includes buildings from the four major areas at TA-53.
Not all buildings at TA-53 are represented.

The Accelerator complex: Blue	**The Experimental and Research Areas: Pink**	**Accelerator Technology Areas: Red**	**Office Buildings: Green**
1) Buildings used to deliver beam and to perform accelerator maintenance. 2) Injector building. 3) Linac (linear accelerator. 4) The Switchyard. 5) Proton Storage Ring. 6) 1L Target Area. 7) Mechanical Equipment Building (MEB).	8) Lujan Center consists of Experimental Room 1, (ER-1) and Experimental Room 2, (ER-2). 9) The Isotope Production Facility (IPF). 10) Experimental Area A. 11) Experimental Area B. 12) Experimental Area C. 13) Blue Room, a part of the Weapons Neutron Research Facility (WNR). 14) WNR Detector Buildings.	15) MPF-365- Administrative and accelerator research. 16) MPF-18 –Mainly experimental research. 17) MPF-14-Majority of space is used for experimental research 18) MPF-19-The entire building is a security area behind a fence; access is through a palm reader portal.	19) MPF-1-Work performed in MPF-1 includes administrative and experimental. 20) MPF-31-Work performed in MPF-31 is exclusively administrative. 21) MPF-6- The Accelerator Technology Office Building. Work performed in MPF-6 is exclusively administrative.

Access

This section gives a broad overview of the requirements to access the TA-53 area. Even though you will see a PTLA guard at the main gate when it is open, TA-53 is not access controlled for classified information or material. It is controlled for property protection and is not a public access site. For further details on access requirements at TA-53 refer to 53FIR 406-300-02.02 Facility Access Control.

Entering TA-53 when the gates are open

Every time you enter TA-53 during normal work hours (usually weekdays from 6:30 a.m. to 6:30 p.m.) there will be a guard at the guard station.

- Stop at the guard station at the gate entrance.
- Show your official Laboratory or DOE security badge to the security officer.
- If you lose your badge, go to the LANL Badge Office (located at TA-3, Building 261) for a temporary badge before entering TA-53.
- If you forget your badge and you are able to retrieve it in a reasonable amount of time, do so. Otherwise, go to the LANL badge office for a temporary badge before entering TA-53.
- If one person in the vehicle has a Laboratory or DOE security badge, that person can vouch for any other occupants in the vehicle. All unescorted people on site are required to have and display a Laboratory or DOE security badge.

You do not have to show your badge when leaving LANSCE.

- When the gates are open, drive slowly past the guard gate as you leave.
- Do not stop unless the guard signals you or the main gate radiation detector alarm sounds.
- If the alarm sounds:
  - Pull into the parking area on the south side of the road, across from the guard station
  - Use the phone to contact HRS-1.

If you host a non-badge-holder visitor to TA-53:

- Notify the security officers at the guard gate. They maintain a list of scheduled visitors.
- Instruct your visitor to show photo identification when they arrive at the guard station.
- If you have not made prior arrangements and if your visitor is a U.S. citizen, they may phone you from the parking lot south of the guard station and wait for you to escort them on-site.
- Non-badge holder foreign nationals are not allowed access to TA-53.

Entering TA-53 when the main gates are closed

After normal LANL work hours or on weekends, the gate is closed and there is no guard at the guard station. A badge reader is located just past the guard station.

- Open the gate from your car by running your badge through the reader. Be sure the magnetic strip on the back of your badge faces the right-hand side of the badge reader.
- The badge reader automatically opens the gate when it reads the code on the magnetic strip on your badge.
- If the gate does not open, call the number posted by the badge reader for assistance.
- The gate closes immediately after your car passes through. You must swipe your badge to open the gate. DO NOT try to follow another car through an open gate; the gate may close and damage your car.

Exiting TA-53 when the main gates are closed

When exiting TA-53 after normal work hours, run your badge through the badge reader to open the gate. There is also a green button next to the exit badge reader that will open the gate.

- The gate closes immediately after your car passes through. You must swipe your badge or press the green button to open the gate. DO NOT try to follow another car through an open gate; the gate may close and damage your car.

Buildings with badge readers

After normal working hours, access to MPF-1, 6, 31 and 622 is controlled with badge readers. These badge readers should work with any official Los Alamos National Laboratory (LANL) badge. If the door is locked you can enter by running your badge through the badge reader.

Integrated Work Management

All workers and visitors at LANL are links in a safety and security chain that creates a safe work place. Each person in the chain must work safely and securely, help others work safely and securely, and protect the environment. The safety and security chain starts with you and flows upward to the LANL Director. Before you begin work, find out who your safety-, security- and environment- responsible line manager (RLM) is. It is usually your group line manager.

Paul Lisowski, LANSCE
Division Leader

TA-53 has an integrated organization for safety. Team, group, and Division safety committees resolve safety problems within their organizations. They can report concerns upward for higher-level management attention through the nested safety and security process. TA-53 safety committees, such as the Radiation Safety Committee and Electrical Safety Committee, report to the LANSCE Safety Council, which is chaired by the LANSCE Division Leader. The LANSCE Division Leader, as Responsible Division Leader (RDL) for the LANSCE facility, has overall responsibility and authority for safety and security at TA-53. Group leaders are responsible for the safety and security of their organizations.

Each experimental area has an Experimental Area Manager (EAM)

The EAM:

- oversees experimental and support activities and has approval authority for operations in the area,
- oversees compliance with all safety policies and operational policies,
- ensures that activities are conducted within the facility safety envelope, and
- serves as the liaison between the Central Control Room (CCR) and the experimental area for accelerator operations.

TA-53 has a resident staff of safety and security professionals with expertise in:

- Electrical safety
- Radiation protection
- Industrial hygiene
- Safety engineering
- Waste management
- Emergency preparedness
- Traffic safety
- Laser safety
- Security

Most of these safety and security specialists work for LANSCE-TMS (Technical Mission Support). They can help you plan safe work, monitor hazards, and interpret laboratory and federal safety regulations.

Integrated Safety Management

All workers are expected to follow the five steps of Integrated Safety Management (ISM):

- Define the work,
- Identify the hazards associated with the work,
- Implement controls for the identified hazards,
- Perform the work, and
- Evaluate the work process for possible improvements.

The Five Steps to Working Safely

The effort applied to the five step process depends on the initial risk involved in performing the work. The lower the risk the less effort required. This is an application of using a graded approach to working safely.

This process is essential to developing Integrated Work Documents (IWD). IWDs are used to document identification of the tasks and or steps, with associated hazards and hazard controls, required to perform an operation safely and securely.

Research (programmatic) work and facility work use different methods for performing work safely, but both are based on the five steps listed on the left. Refer to LIR 300-00-02 IWM for Work Activities for further information.

Stopping Work

It is very important for every worker at LANL to understand that you have the right and the responsibility to stop work if you think it is not safe or may be violating security. If you see a person performing work unsafely or unsecurely, take action.

- First, talk to the worker and explain the danger or risk.
- If the worker does not stop, and you still think there is a danger or risk, notify your RLM.

For more information regarding your stop-work authorities, see LIR 401-10-01.

Integrated Work Management for Work Activities

Integrated Work Management (IWM) is the Laboratory's process for doing work in a manner that protects people, property, the environment, and national security. IWM is the way that LANL implements the five steps of ISM for work activities.

Moderate or high hazard work, as defined by IMP 300-00-00, Integrated Work Management for Work Activities, must be performed under an Integrated Work Document (IWD). If you are working under an IWD, you must participate in a pre-job briefing for the work and check to make sure that hazard controls remain effective to protect you and other workers.

If your work does not require an IWD, you are still responsible for working safely and following procedures and requirements.

Work Authorization

LIR 300-00-00, IWM, LANL defines two types of authorization: “work” authorization and “worker” authorization. Work authorization is approval for a work activity to take place. The Responsible Line Manager for the work authorizes activities based on adequate hazard controls. The RDL for the LANSCE facility (or his designee) approves activities based on proper implementation of the IWM process and adequate controls for facility hazards and co-located work.

Worker Authorization

Once the work has been authorized, you as the worker must be authorized to perform the work. You are responsible for keeping your required training current and assuring your fitness and readiness to perform work.

- You are authorized to perform work independently when your "knowledge, skills, and abilities are sufficient to perform the work safely.

- You may only perform work that you are authorized to do.

- Your RLM & RDL must authorize your work and communicate the authorization to you.

- If you are working under an IWD, the Person in Charge (PIC) for the activity will ask you to confirm your authorization and readiness to perform work.

- If you are working under an IWD, your signature on the IWD confirms that you are authorized, qualified, and fit to perform the work.

- Line managers authorize workers to perform work.

- Line managers review and renew authorizations periodically. Work and worker authorization is often documented using a Hazard Control Plan (HCP) or an Integrated Work Documents (IWD).

Authorizing Work and Workers for Activities Involving Multiple Groups

At times, people from multiple organizations and sub-contractor groups work together on an activity. When people from different organizations perform separate tasks, the group sponsoring the project authorizes the work and the worker's parent organization authorizes the worker who will perform the work. To ensure that everyone is aware of all the hazards, controls, and responsibilities for a job, pre-job briefing are a requirement of the Integrated Work Management program at LANL. See IMP-300-00-00 Integrated Work Management for Work Activities and the TA-53 Safety Standard, 53-SS-300-00-0, Pre-Job Safety Meetings for additional information.

Hazards and Controls at TA-53

We manage the risk at TA-53 by using both engineering controls and administrative controls.

- Engineering controls are structural or mechanical systems or tools that help reduce hazards.

- Administrative controls are non-structural or non-mechanical methods, such as procedures, postings, permits, access restrictions, training, or time restrictions that help reduce exposure to the hazards.

Hazard Postings at TA-53

Hazard warning signs are posted at TA-53 area entrances and exits to alert you to hazards and necessary precautions. The most common postings are for radiation hazards, electrical hazards, confined spaces, magnetic fields, noise hazards, and some chemical hazards such as lead or beryllium. If multiple hazards are present in an area, there will be multiple postings. Look carefully at all the postings in an area.

Electrical Hazards and Controls

TA-53 has the largest number of high-power equipment with high voltage and/or high current at LANL. TA-53 is the single largest user of electrical power in Northern New Mexico during beam operation. Engineering controls for electrical hazards include:

- Keyed access control systems to prevent unauthorized access to high voltage systems

- Circuit-protection devices, which stop current flow when conditions become unsafe;

- Insulated tools for work near exposed electrical conductors;

- Insulation materials that stop or reduce the flow of electrical current; and

- Equipment designs that use grounding conductors to direct unsafe current to the ground.

Administrative controls for electrical hazards include requirements such as:

- Special Electrical Work Permits (SEWP) for unique electrical tasks.

- The two-person electrical safety rule, which states that two qualified energized electrical workers must be present in the workplace and be aware of each other's tasks while performing electrically hazardous work.

- Lockout/Tagout procedures to ensure that equipment remains de-energized while people perform work on equipment or systems.

The SEWP form, ES&H form 1641, is available on-line at http://enterprise.lanl.gov/esh.htm. Subject-matter experts and a line manager must review and approve the permit.

Even if you are not an electrical worker, you may work near electrical hazards. One of the most common electrical hazards is misuse of extension cords. According to the National Electrical Safety Foundation, you should only use extension cords temporarily. They are not made for constant use. Never daisy-chain multi-outlet strips.

- HCPs or IWDs for routine activities that involve electrical hazards. In cases where stored energy may be present in a capacitor, formal steps describe discharging the capacitor before work begins.

- Electrical training if you perform electrical work and on-the-job training for work on specific electrical systems.

- Personal protective equipment (PPE) for electrical work includes such items as insulating gloves and nonconductive head protection. Check the work control document for the task you are going to perform for the required and suggested PPE.

Hazards and Controls at TA-53: Traffic

Government vehicles, private vehicles, forklifts and other low speed vehicles, bicycles, and pedestrians share the roads at TA-53.

Car crashes are the leading cause of on-the-job fatalities in the United States. Since 1999, there have been at least three traffic collisions/crashes on the roads at TA-53.Contributing causes were:

- speed,
- driver inattention, and
- glare from sun or snow.

Watch out for others and yourself while driving.

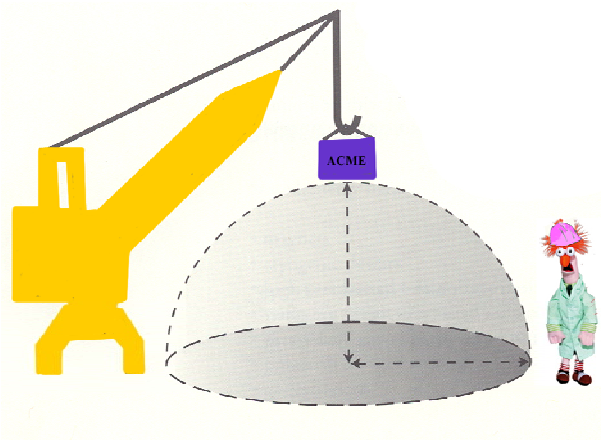
- observe speed limits and traffic signs, and
- be very observant for pedestrians and slow-moving vehicles.

If you observe unsafe driving at TA-53, try to get the vehicle license plate number and report the unsafe driving to the TA-53 LANSCE-TMS group. Their telephone number is 665-8363.

Material-Handling and Heavy-Equipment

Using equipment to move heavy materials is a common activity at TA-53. We use cranes and forklifts to lift and position equipment and material.

- Operate cranes or forklifts only if you are trained, licensed, and authorized on the specific equipment.
- Follow postings and pay attention to warning horns to stay clear of the operation.
- Wear a hard hat when in the area of crane operations.
- NEVER put any portion of your body under a load.
- Maintain a “cone-of-safety” distance from a raised load; this means your distance from a suspended load should be equal to or greater than the height of the load unless you are directly involved in the operation.



Ergonomic injuries

These can be painful and disabling and account for approximately 50% of all reportable injuries at LANL. To protect yourself, make sure your workstation, computer, or tools fit you and your work.

- Use LANL's ergonomic self-assessment on the ergonomic web site http://int.lanl.gov/safety/ergonomics/, or contact the LANSCE ES&H team (5-9822) for an ergonomic evaluation.
- You can take LANL's ergonomic training.
- See the ergonomic web site for more tips.

Address ergonomic problems early, before they become painful.

Chemical Hazards

Small quantities of many chemicals, including oils, organic solvents, some carcinogens, cleaners, and paint are used at TA-53. If you work with chemicals, you must take Chemical Hazards Communication training.

Beryllium Hazards

We do not machine beryllium parts at TA-53, but we use metal parts that contain beryllium. There are beryllium components in filters, reflectors, and targets. However, beryllium metal can become a health hazard if it becomes airborne through oxidation or machining. It has been linked to chronic beryllium disease (CBD), a disorder that attacks the lungs. If there is a reasonable possibility of exposure to beryllium hazards in your work you will need to take the Beryllium Health Hazards class.

Mercury Hazards

Working with mercury requires special training and personal protective equipment.

- ER-1 and ER-2 use several mercury shutter systems to control delivery of neutrons from the 1L Target to different instruments.
- Building 16 also stores mercury.
- The mercury is in enclosed systems and containers, but it may spill during shutter repair or maintenance.
- Mercury is poisonous, especially the vapors.

Lead and Cadmium Hazards

At times, we use these materials for radiation shielding. The primary hazard from these materials results from ingestion. If you handle lead on a regular basis you will need to take the Lead Awareness class.

Magnetic hazards

There are many different forms of electro-magnets at TA-53 that pose a hazard due to the large magnetic fields they generate as well as the electrical hazards present during their operation. Do not carry ferrous tools or instruments near large energized magnets, as they may be pulled into the magnet and cause injury.

Elevated-Work-Surface Hazards and Controls

At times, you may need to perform activities on ladders and platforms or near excavations. Falls from heights are the second leading cause of on-the-job fatalities in the U.S.

- If you use a portable ladder or a platform over 6 feet off the ground, or if you work near an excavation that is more than 6 feet deep, you must complete training for fall protection.
- If you are not part of the job, stay clear of the area.
- All workers at TA-53 who use portable ladders in their work are required to take Ladder Safety training.

Laser Hazards

Workers use lasers up through Class IV in several experimental areas, as well as in one Building 1 laboratory.

- Laser areas are posted and eye protection is required when you are in the area when the laser is turned on.
- Exposure to a direct laser beam can cause eye injury or blindness.
- Skin exposure can cause burns.
- Lasers can also contain high-voltage electrical hazards.

If you work with class 3B or 4 lasers you will need to take Laser Safety: Class 3B or 4 online courses.

Confined-Space Hazards and Controls

Confined spaces are areas that:

(1) Are large enough for a worker to enter and perform work,
(2) have limited access or egress, and
(3) are not continuously in use.

There are different types of confined spaces:

- permitted confined spaces and
- non-permitted confined spaces.

Confined spaces are posted. Only trained and qualified personnel can enter confined spaces. For more information, see LIR 402-810-01, Confined Spaces.

Penetration and Excavation Hazards and Controls

At times, personnel may need to break through walls, ceilings, floors, etc. Or they may need to build a trench or excavation. If you perform this type of work, you must complete training for the equipment you will use, and, most often, you will need special permits. If you are not involved, stay clear of such areas.

- LIR 402-880-02, Penetrations, describes requirements for penetrations.
- LIR 402-880-01, Excavation/Soil Disturbance Permit Process, describes requirements for excavating at LANL.

Cryogenic Fluid Hazards and Controls

Cryogenic fluids are gases that are so cold they have turned to liquid. At room temperature they boil and convert to back into gases, displacing oxygen. The common cryogenic fluids that are used at TA-53 are helium and nitrogen. This hazard is controlled by using:

- PPE such as thermally insulated protective gloves and eye/face protection when handling cryogenic fluids,
- insulating cryogenic fluid containment vessels to protect a worker from coming in contact with a super cold surface, and
- low-oxygen alarms in areas where there is possibility of oxygen-depletion caused by a large spill of cryogenic fluids.
- Only trained and authorized personnel can work with or handle cryogenic fluids.

Pressure or Vacuum Hazards and Controls

Instruments may use vacuum in their operation or may require carrier gas. Experiments may use pressure vessels. Controls for these hazards include:

- Vessel design,
- pressure fittings and gauges,
- relief valves, and
- regulators.
- written work control documents like IWDs
- periodic preventive maintenance, and
- training for work with pressurized systems above atmospheric pressure.

Gas-Cylinder Hazards and Controls

Gas cylinders are used for a variety of reasons at TA-53. The cylinder valve is the most fragile part; if it breaks, the cylinder can become a missile. To prevent this:

- Secure cylinders in an approved manner,
- keep the valve cap in place when not using a gas cylinder,
- never store gas cylinders on a cart, and
- always remove the regulator when the gas cylinder is not in use.

Radio Frequency (rf) and Microwave Hazards and Controls

The rf energy generated by the klystrons used to power accelerators, as well as microwave radiation, can cause tissue heating and damage if uncontrolled. Personnel are protected by:

- Enclosed wave-guide systems,
- maintenance procedures, and leakage monitoring.
- never store gas cylinders on a cart. And
- always remove the regulator when the gas cylinder is not in use.

Flammable and Combustible Material Hazards and Controls

There are many flammable or combustible materials used at TA-53. They include:

- Flammable gases like hydrogen, acetylene and propane.
- Liquid solvents, widely used for cleaning parts.
- Polyethylene shielding and packing materials.

If you perform an activity (for example, welding, cutting, burning, brazing, or grinding) that produces enough sparks or flames to be a fire or health hazard, there are additional administrative and engineering controls. LIR 402-840-01.1, Welding, Cutting, and Other Spark- or Flame-Producing Operations, describes these controls.

To control these hazards:

- Use approved flammable-liquid cabinets.
- Store materials in areas with sprinkler systems.
- Follow administrative requirements to limit the amount of combustibles, like those used in packing materials.
- Keep ignition sources, oxidizers, and reactive chemicals away from flammables.

Office Hazards and Controls

Office work has its own set of hazards. Falls are the most common office accident, accounting for the greatest number of disabling injuries among office workers. The use of more technology in offices introduces other hazards, such as mechanical hazards.

Consult LANSCE Safety Standard, 53 SS 402-801, Office Safety for guidance. For assistance with office safety issues, including ergonomic evaluations, contact the LANSCE-TMS group at 665-8363.

Housekeeping Hazards and Controls

One of many contributing factors of accidents and fires at work is poor housekeeping. As you clean your area, don't move your housekeeping problem into the hallway or into someone else's workspace.

Important housekeeping practices include the following:

- Keep aisles and hallways clear (leave an exit path),
- designate storage spaces for portable equipment and carts,
- keep emergency equipment such as fire extinguishers in view and accessible,
- keep work spaces as uncluttered as possible,
- store heavy items on lower shelves and lighter items on upper shelves, and
- do not block access to electrical panels.

Machine Shop/Tool Hazards and Controls

Several buildings contain machine shops or tools such as:

- drill presses,
- band saws,
- metal shears, etc.

Some shops only allow certified machinists to operate tools. In other shops, you must complete specific training requirements before you are authorized to operate the equipment. Check the requirements for the shop you plan to use. When entering a shop area, observe safety signs and follow the posted PPE requirements. LIR 402-850-01, Staff Shop Operations, also describes requirements and controls.

High-Explosive Hazards and Controls

Workers perform experiments with high explosives (HE) in Experimental Area C and in the Blue Room at WNR. Researchers at the Lujan Center conduct non-explosive experiments with small samples of HE. If an uncontained HE accidentally explodes, it could result in serious injury or death. DX Division controls operations with explosives at TA-53 as follows:

- They limit the amount of HE in the experimental area.
- They post the outside of the area with an orange metal sign that tells the fire department and emergency personnel what type of explosive is in the area.
- They restrict access to the delivery area when HE is present.
- They perform a pre-job briefing.
- The Radiation Security System (RSS) excludes people from the experimental area during these types of experiments.

Isolated-Area Hazards and Controls

When working in isolated areas, such as in beam-line tunnels, your supervisor may ask you to follow the "Buddy Rule," which is a control set in place to reduce the risk of working alone in an isolated area. It requires a worker to maintain hourly contact with a second person either in person, by phone, or by radio. If two people are working in an isolated area and one of them must leave, the one who leaves must find a new worker to serve as the buddy for the one who remains in the isolated area.

Wildlife, Fire Hazards, and Rough Terrain and Controls

The TA-53 mesa is home to a variety of wildlife, such as elk, snakes, mice (which pose a potential Hantavirus hazards), scorpions, bears, coyotes, etc.

- Do not handle wildlife.
- If you see wildlife droppings in the buildings, inform your Facility Building Coordinator.

Be alert to notices of changing fire conditions.
At times, LANL prohibits hiking, biking, running, and other non-work activities on undeveloped areas around the Laboratory because of changing fire conditions in the area.

There is rough and uneven ground around some TA-53 buildings. Be careful walking; wear sturdy shoes appropriate for the terrain.

Prompt Ionizing Radiation

The proton beam produces a radiation field by interacting with materials in components, beam stops, and targets. Radiation fields vary from negligible to very high. Once the beam is turned off, the radiation — called prompt radiation — disappears. There are three major controls for prompt radiation to reduce the residual risk to minimal.

- Radiation Security System (RSS)
- Shielding
- Administrative Controls

Radiation Security System

The most important engineering control is the Radiation Security System (RSS), which is comprised of:

- Beam plugs that stop the beam if any RSS input such as an interlock is activated indicating unallowable prompt-radiation hazards.
- Beam-spill monitors (gamma detectors) sound alarms and shut off the beam if they detect high radiation dose rates.
- Beam-current limiters that ensure that the beam stays within safe operating limits, thus reducing maximum hazard from a beam-spill accident.
- The Personnel Access Control System (PACS) is a hardware system that includes interlocks and sets of special keys that prevent personnel from access to areas that have high radiation levels.

You must receive additional training to access the primary beam tunnels and other areas that are under control of the RSS.

Shielding

Shielding is another engineering control.

- Beam lines and target areas are surrounded by concrete, steel, and packed dirt (at least 10 feet deep) to shield people from radiation hazards.
- Thick concrete doors at Sector B and Area C and polyethylene-covered steel doors and concrete entry mazes at the Line D entrance provide additional shielding.
- Steel, concrete, lead, and polyethylene are used to shield targets, secondary beam lines, flight paths, and experiments to further reduce radiation hazards inside the experimental halls.

NOTE: The primary protection from prompt radiation hazards at TA-53 is concrete, steel, lead and polyethylene shielding. HSR-1 support and surveys are required anytime the shielding is to be removed or modified.

Training requirements for access to Radiation Areas

All workers with unescorted access to Radiation Areas at TA-53 must be up-to-date on their radiation safety and facility-specific training requirements.

Workers with unescorted access to radiological Controlled Areas must be up-to-date on General Employee Radiological Training (GERT) or equivalent Radiological Worker (RW I or RW II) training, and facility-specific training.

Additionally, there are areas or building specific training requirements. See the LANSCE Training Office for specific requirements.

Dosimeters

Dosimeters are used to record any ionizing radiation exposure you may receive while working at TA-53. You are not required to wear a dosimeter everywhere at TA-53 and those areas that do require a dosimeter are posted. There are two primary types of dosimeters used at TA-53, the TLD and the PND.

Thermoluminescent Dosimeters (TLD)

Workers must wear TLDs in all posted radiological posted areas at TA-53. The TLD is worn above the waist. The two foil circles face out. The other side of the dosimeter reads, “This side toward chest.”

- Do not leave your TLD on the car dashboard. The heat and sunlight might affect the reading and can deform the plastic holder.
- Do not place it in x-ray equipment; try to avoid taking it on travel.
- If you are undergoing medical treatment with a radio-isotope inform HSR-12 before wearing your TLD.

Short-term workers get dosimeters from the Visitor Center in Building 1. TA-53 residents and long-term visitors must enroll in the Laboratory Dosimetry Evaluation System. To enroll, go to the LANL dosimetry website at
http://eshdb.lanl.gov/%7Eesh12/new_eshdb/DosimetryAll.htm.

Whenever you change job assignments that might affect your radiation exposures, you must re-enroll in the program.

Personal Neutron Dosimeter (PND)

A PN-3 Track Etch Dosimeter (PND), or “lemon badge,” measures higher-energy neutrons, which cannot be measured by the TLD.

When the beam is operating, you need to wear a PND when working in the line B tunnel, ER-1, ER-2, WNR (including Blue Room), MEB, REB, or the 1L target fence area.

Dosimetry Plants

RCTs place dosimetry “plants” at many locations within the accelerator complex and research areas. Dosimetry plants collect potential dose information in an area. RCTs use the information to plan for shielding and to investigate unexpected elevated dose exposures. They are official dosimetry records; it is a violation of regulations to interfere with them. Do not remove dosimetry plants. Only RCTs can remove dosimetry plants.

Radiological Work Permits (RWP)

Workers use an RWP to perform non-routine radiological activities. The RWP describes:

- Work to be performed
- Pre-job Radiological conditions in the work area.
- ALARA/Radiological protection requirements.
- PPE
- Respiratory
- Dosimetry
- Monitoring
- Radiological training
- ALARA requirements
- Hold points and special instructions.
- Approval(s) required.

The RWP is also used to record post-job radiological conditions.

Radiological control postings

Radiological control postings communicate radiological hazards. They alert you to the presence of ionizing radiation hazards and radioactive materials. Postings identify areas controlled for radiological purposes based on:

- radiation dose rates,
- presence of radioactive material,
- contamination levels, and/or
- airborne radioactive contamination.
- Postings can change frequently based upon changes to the hazard conditions.

Below is an example of a posting you might see.

You will see another posting along La Mesita Road where the Line D proton beam passes under the road from the switchyard to the WNR facility. This posting states “No Stopping Next 50 Feet. For extended access, see the Facility Manager.” This is an administrative control used to reduce worker exposure in the unlikely event of a beam spill along Line D.

Volume-Contaminated Materials/Volume-Activated Materials

Although radioactive materials are brought into and used at TA-53, volume-contaminated materials (also called “activated” materials) are the most common type of radioactive materials in the area. When particle beams or secondary particles interact with materials, they may become radioactive. We call these materials “volume contaminated” or “volume activated,” interchangeably. The material may remain volume contaminated or activated for minutes, several weeks, or longer. Examples may include:

- samples,
- experimental apparatus,
- beam-line components,
- targets, and
- shielding.

Materials closest to the beam line tend to be the most activated. There are four main controls for reducing risks associated with volume-contaminated and -activated materials:

- Training
- Personnel Access
- Postings
- Barcoding or labeling

Training Requirements

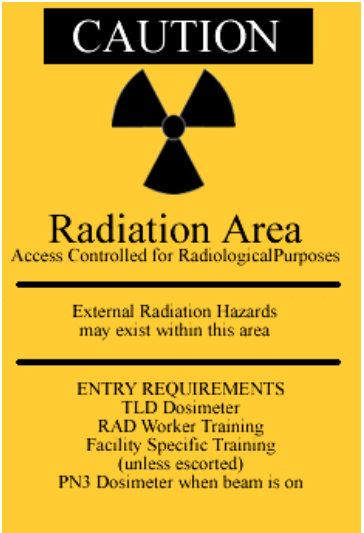
You must have RW I or RW II training to handle volume-contaminated or activated materials.

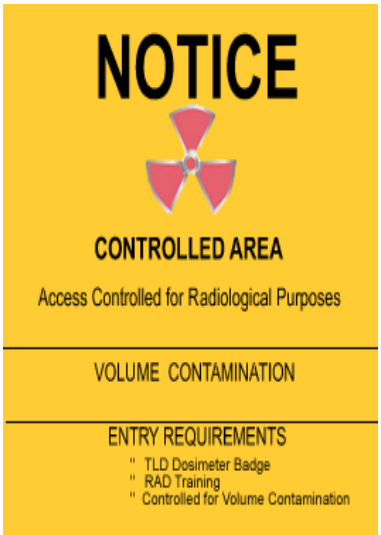
Personnel access

Personnel access control is used to control worker access to activated beam-line components and targets. When you must handle a highly activated component, contact an RCT. If possible, wait for the activity to drop before handling it. Check with an RCT for storage requirements for volume-contaminated equipment that is not currently in use.

Postings

The examples below are some of the postings you may encounter at the entrances to the experimental areas and some of the equipment areas at TA-53.





These postings communicate several things.

- First, there is a reasonable potential for radiation hazards in the area.
- Second, a general description of the hazard.
- Third, the minimum requirements on the bottom of the posting will vary depending on the conditions in the area. Conditions can change frequently, so always read postings each and every time you enter or exit a posted area.

Barcoding

RCTs barcode all equipment, samples, instruments, etc., that are exposed to a beam line before they survey the equipment. The information goes into a database inventory.

- If the equipment is activated, the RCT tags it with a “Health Physics Radioactive Material Survey Tag.”
- If there is no activation, the RCT attaches a Material Release Tag and removes the barcode from the database.

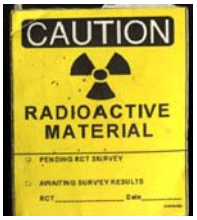
If you see a sample, part, equipment, etc., with a barcode, do not remove it from the accelerator complex or experimental area until an RCT surveys it and places the appropriate tag on.

Removing items from a Radiological Control Area

If you need to remove any material or equipment from a Radiological Control Area (RCA) that may have been exposed to the beam or that is potentially radioactive, you must first contact a Radiological Control Technician (RCT) to survey and tag it appropriately. Make sure that you READ AND FOLLOW ALL EXIT POSTINGS when leaving an RCA.

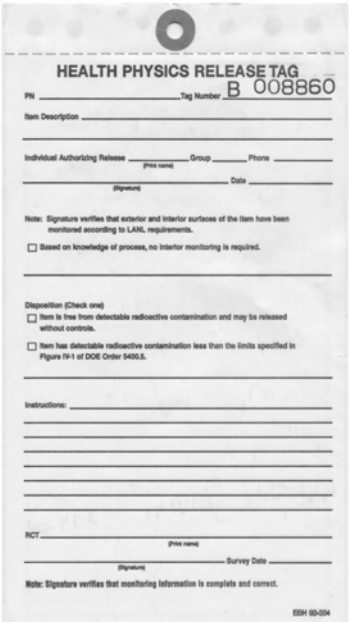
Labeling potentially radioactive items for survey

Sometimes an RCT is not available to survey an item immediately. In that case, attach a "Radioactive Material" label to the item and place it in a designated area.



If you use this label, be sure to mark the box for “Pending RCT Survey.” As soon as possible, the RCT surveys and tags the item. If there is no activation, the RCT attaches a release tag. You may remove items from experimental areas if they have a “Materials Release Tag.”

If the RCT detects activation, a “Health Physics Radioactive Material Survey Tag,” which is shown below, will be attached.



Do not remove an item until it has a Material Release Tag. This serves as an administrative control to reduce the risk of radioactive materials in uncontrolled areas.

Postings

Some areas are controlled for surface contamination, which is radioactive material in an unwanted or uncontrolled location. Examples of such areas are Area A East and the 1L Target service area. We use the following posting for surface contamination.

This posting communicates four things:

• First, there is the potential that equipment, instruments, dust, etc., in the room may have surface contamination.
• Second, it states that you must wear a TLD and protective clothing, such as booties or coveralls.
• Third, you must complete radiation training before entering.
• Finally, to keep contamination from spreading to other areas, an RCT must survey everything, including people, as they leave the area. An RWP will list the specific requirements.

Controls for prompt radiation, except the RSS, also apply to other radiation hazards, such as:

Radioactive sources

- We use radioactive sources mainly to calibrate equipment.
- You must be trained and authorized to use sources.
- Some sources are part of a controlled inventory and must be registered with HSR-12.

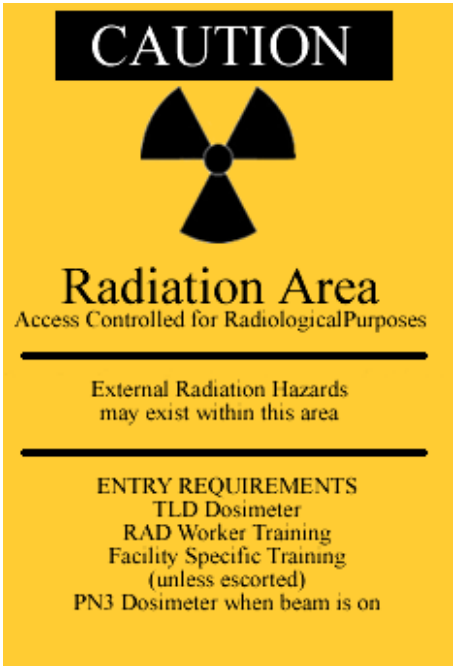
X-ray machines

- Scientists use x-ray machines for research and diagnostic work.
- X-Rays are highly penetrating and are best shielded by very dense materials such as lead.

Klystrons

- Klystrons are machines that produce x-rays as a by-product of generating high-power radio-frequency (rf) energy.
- The x-rays are localized, shielded by lead, and present only when power is on.

Further radiological postings include those for Controlled Areas, Radiological Buffer Areas, Radiation Areas, Radioactive Materials, Localized Hot Spots, etc.



Personnel Contamination Monitors

You will find Personnel Contamination Monitors (PCMs) in some experiment areas. They are used to measure surface contamination on your shoes, clothes, and/or skin as you leave areas where there is a possibility for you to have been contaminated.

If you need to work in areas where PCMs are used you will receive additional training.

Shipping radioactive materials

Transportation of radioactive materials is regulated by Department of Transportation (DOT). Assume all radioactive material must be shipped according to DOT regulations until told otherwise by a certified shipper. This reduces the chance for accidents and contamination spread.

To transfer radioactive material from one facility to another within TA-53, contact an RCT.

Controls for transporting radioactive materials between LANL facilities or for shipping materials off-site include the following:

- The material must be packaged, marked, and labeled following Department of Transportation (DOT) regulations.
- Only vehicles that meet the Federal Motor Carrier Safety requirements can be used to transport the material.
- Drivers must be trained and qualified.
- Each transfer between facilities must be documented on a Radioactive Materials Transfer Form (RMTF).
- The Packaging and Transportation Group (SUP-5) must review and approve each RMTF form before shipment.

Contact the LANSCE Technical Mission Support group at 665-8363 for assistance.

Receiving radioactive materials

An RCT must be present to open any packages of radioactive material received at TA-53 to help control potential contamination spread.

Most often, users, guest scientists, and other off-site personnel ship radioactive materials to HSR-1 at TA-53 rather than to individual scientists. This helps ensure that RCTs open, survey, and safely store radioactive material within 8 hours of arrival.

Main Gate Radiation-detection system

Another engineering control for radiation hazards is the radiation-detection system at the main exit gate. It is the “last line of defense” for TA-53, and it is important that you follow all administrative controls for radioactive materials BEFORE they reach the gate. If the system detects radiation as your vehicle leaves the site, an alarm will sound. If this happens:

- Pull over to the parking area next to the guard station.
- Call HSR-1 from the telephone available at the gate and wait for an RCT. The telephone number is 7-7069. The number is also posted by the telephone.

A camera takes a photo of any vehicle that causes an alarm, so save the embarrassment of a “manhunt” and wait for the RCT.

If you undergo any internal medical radionuclide therapy, report it to the Radiation Protection Services Group (HSR-12) and the TA-53 HSR-1 group before entering or leaving TA-53. The radiation detection monitor at the main gate is so sensitive, you may set off the alarm as you enter or leave the TA-53 main gate.

Waste Generator

A “Waste Generator” is an individual and/or line manager having direct responsibility for operations that generate waste. If you generate waste, you are responsible for the characterization, storage, and disposal of the waste, as described in LIR-404-00-02.3, General Waste Management Requirements. TA-53 has Waste Management Coordinators (WMCs) who guide and coordinate waste-management activities and resolve waste-management issues for Waste Generators.

If you are a Waste Generator, you must do the following:

- Complete required waste-generation training. Please contact the TA-53 Training Office for information and scheduling.

- Ensure that waste generated has a disposal path or is authorized to be generated. Creation of mixed waste, which is hazardous waste that also has a radioactive component, requires line-management approval. Creation of waste with no defined disposal path requires DOE approval.

- Provide accurate and complete waste-characterization information and documentation to ensure that regulated constituents in waste streams are identified. Contact your WMC for guidance.

- Package, mark, label, and manage waste in accordance with regulations applicable to the waste.

- Notify your manager or the Facility Manager on call (664-7466) of any planned or accidental release of waste or waste water to the environment or discharge to a piped drainage system. If the Facility Manager cannot be reached during an accidental release, notify the Emergency Management and Response Group (EM&R).

- Notify the WMC of any planned generation of waste or change of an established waste stream. Use the “Waste Service Request System” under the "Environmental" link on the LANSCE-TMS website at: http://int.lansce.lanl.gov/LANSCE-10

Chemical Waste

Do NOT abandon chemicals and/or waste. If you leave a group or operation, coordinate with your line manager to determine who will take over responsibility of the chemicals and waste if they are not properly handled before you leave.
Practice and support waste-minimization activities, including the following:

- Replace hazardous materials with less-hazardous or non-hazardous materials,
- replace disposable materials with re-usable materials if feasible,
- reduce the amount of waste,
- treat waste when possible to make it less hazardous,
- practice good housekeeping,
- keep different kinds of waste or chemicals separate, and
- re-use or recycle materials whenever possible.

In the event of:	You should:
Fire or smoke	1. Pull nearest fire alarm box. 2. Report to the muster area. 3. Call 911 and stay on the line until released by the 911 operator 4. Notify your supervisor or line manager. The supervisor or line manager will be responsible for contacting additional personnel if necessary.
A suspicious package or possible explosive device	1. Call 911 and stay on the line until released by the 911 operator 2. DO NOT pull a fire alarm, instruct others to leave the building and meet at the muster/ assembly areas. 3. Notify your supervisor or line manger. 4. Go to the muster area as soon as you get off the phone with 911 operator. 5. Remain in the assembly/muster area for further instructions or until an "All Clear" signal or other instructions have been given.
A medical emergency	1. Call 911 and ask for an ambulance. 2. Provide first aid if you are qualified. Automatic external defibrillators (AEDs) are placed throughout TA-53 and can save a life (see http://int.lansce.lanl.gov/LANSCE-10/) 3. Notify your supervisor or line manager. The supervisor or line manager will be responsible for contacting additional personnel if necessary.
Medical emergency: electrical	1. DO NOT attempt to rescue a victim from a live circuit. 2. De-energize circuit if you can do it quickly and safely. Examples include turning off a power switch, pulling out a small power plug, or activating a red Emergency System Shutdown (locally referred to as a SCRAM switch). 3. Call 911 to request medical help. 4. If the circuit has been de-energized, provide first aid if you are qualified. Defibrillators are available in many areas. 5. Notify your supervisor or line manager. The supervisor or line manager will be responsible for contacting additional personnel if necessary. 6. Remain at the scene until emergency personnel arrives.
Spills	1. If the spill is small and you know how to clean it up, you may do so if it is safe. Some areas have spill kits which are easy to use. 2. Secure safety of yourself and others in the work area. 3. If it is a large spill call 911. 4. If the spill is located in a Radiological Area, call an RCT at 7-7069. 5. Notify your supervisor or line manager. The supervisor or line manager will be responsible for contacting additional personnel if necessary. 6. Prevent spills from entering drains or going into drainages if it is safe to do so
A work related injury, illness or toxic exposure during normal work hours (7:30am to 5pm).	1. You must report to the Occupational Medicine Clinic (HSR-2) at TA-3, Building 1411
A work related injury, illness or toxic exposure during off hours or on the weekend.	1. Report to the nearest urgent care or emergency room for treatment. 2. You must report to the Occupational Medicine Clinic (HSR-2) at TA-3, Building 1411 on the next work day.
A work-related injury, illness, or toxic exposure at work off-site (away from LANL).	1. Report to the nearest urgent care or emergency room for treatment. 2. You must report to the Occupational Medicine Clinic (HSR-2) at TA-3, Building 1411 when you return to the LANL site.
Other emergency or incident	Call 911 and remain on the line until emergency personnel arrive. Notify your supervisor or line manager.

If you are not sure if an event is an emergency or if you cannot find your supervisor or line manger, call the EM&R Office at 7-6211. Then notify your supervisor. For non-emergency events, call your supervisor or line manager.

Responding to Alarms

Check the emergency evacuation posters in buildings where you perform work.

- The posters show evacuation routes and muster/assembly areas in case of an emergency or building-wide alarm.
- They show the shelter-in-place location for the building.
- They also show locations of fire extinguishers and defibrillators.

Sometimes you must take secondary protective actions during emergency evacuations. For example, if a fire alarm sounds during a thunderstorm, it may not be safe for you to evacuate the building and assemble outside at the assembly area. Instead, the Facility Manager or other authorized person may direct you to a sheltered area, perhaps in another building.

If you.....	Then.....
Hear an building-wide alarm, such as a fire alarm or area radiation monitor	1. Leave the area. 2. Assemble at the muster area. 3. Remain in the assembly/muster area for further instructions or until an "All Clear" signal or other instructions have been given by the Incident Commander.
Receive a building-wide shelter-in-place announcement via a paging system, telephone, etc.	1. Walk to the shelter-in-place location if it is in your building. If you do not know where the shelter location is, stay inside where you are. (Note: Do not self-monitor before leaving an experimental area. If you are outside, consider placing a handkerchief or a cloth over your mouth and nose to help prevent possible inhalation of contaminants, like smoke, until you reach a safe location.) 2. Follow instructions posted on the wall at the shelter location. 3. If it is not possible or safe to reach the shelter-in-place location, use a room where you can turn off the ventilation and close outside doors and windows. 4. Remain there until you receive an "All Clear" or other directions.
Set off a personnel-contamination monitor	1. Stay in the area. 2. Call an RCT. LANSCE posts the number by the telephone near the monitor. 3. Follow the RCT's instructions.
Set off the gate alarm near the guard gate while driving out of LANSCE	1. Pull into the parking lot across from the guard station. 2. Use the telephone near the guard gate to call an RCT. 3. Follow the RCT's instructions.

Alarms

You may hear one of the following alarms within the accelerator complex or some experimental areas.

If you…..	Then…..
Hear a neutron alarm (such as an albatross monitor)	Evacuate the building immediately. Notify an RCT.
Hear a sweep alarm (which means that beam will soon be activated)	Push the nearest scram button to prevent beam. Evacuate the building.
Hear a Continuous Air Monitor (CAM)	Leave the area. Notify an RCT.
Hear a low-oxygen alarm	Evacuate the building immediately. Notify the supervisor and Facility Manager

Lessons Learned

TA-53 and LANL have a lessons- learned program to help workers use operational experiences to improve safety, security, or the effectiveness of their activities. This section describes some recent lessons learned at TA-53 and other DOE laboratories to help you plan and carry out work.

Recognize hazards of routine activities

Just because an activity is routine does not reduce its hazards. In 2002, a team of LANSCE employees worked for several weeks moving heavy shielding. Many of the loads required detailed task plans. Near the end of the project, they had to move a much smaller, 250-lb steel beam. Because it was a small load, the team did not discuss a plan for loading and unloading the beam. They did not clearly identify the roles for each person performing the task. Then, because there was not enough space, the forklift could not move the beam directly into position. When one of the spotters tried to move the beam from the forklift tine to its correct position, the beam fell on another worker’s foot. The result was a serious injury. The workers learned that even routine forklift operations require planning, and each person involved in a shared task must know his or her responsibilities.

As a second example, a LANL researcher performing routine work using a power strip received a minor electrical shock when touching two pieces of equipment. It turns out that the metal ground connection on the power strip had fatigued and spread. Worn, loose, and poor connections can also generate heat and arcs, causing fires. The researcher had to suspend his activity and find out the cause of the shock. He learned to inspect his equipment, even equipment used regularly.

As a third example, in 2001 a LANL employee was performing routine work under an HCP and fell through a false ceiling. He broke both of his ankles. The HCP identified the potential for elevated surface hazards, but the particular area was not posted as an elevated surface. The result was a serious injury. The worker learned to take into consideration the unidentified hazards of work environments.

Driving at TA-53 is another routine activity. There have been at least three vehicle accidents along the 0.25 mile stretch of road between Building 1 and West Alvarez Road since 2000. Watch your speed as you drive between work areas. Stay alert to other drivers who pull out from side roads and parking lots.

Follow the Hazard Control Plan or other work control documents

If an HCP is in place, follow it. A LANSCE group has an HCP requiring the power supply to be turned off and locked out (using lockout/tagout procedures) before connecting the leads.

In 2002, a worker received a mild electric shock when touching the exposed metal portion of a connector. He was attaching a chart recorder to external electrical test jacks on an energized magnet power supply. Had he followed the HCP, the power would have been off. Although it was only a minor shock, the voltage and current at the external test jacks could have been as high as 340 V and several hundred amperes.

In addition to following HCPs, be sure to follow Laboratory Implementation Requirements (LIRs), a number of which have been called out in this training document for your review. The requirements intend to protect workers.

In 2001, a worker chose to violate Laboratory Implementation Requirements, "Lockout/Tagout for Personal Safety." The LIR states that the person who applies a red lock and/or tag must be the one to remove it. If the individual is not available to remove the lock, then it is the safety-responsible line manager's responsibility to provide an equivalent level of safety before removing the lock and/or tag. In this case, a worker independently chose to saw off the lock hasp. When the violation was discovered, the worker received disciplinary action. He learned there could be serious consequences for not following LANL requirements.

Revise HCPs or other "requirements documents" if necessary

Sometimes an HCP may not address a hazard control. This is especially true for abnormal conditions or troubleshooting.

In the spring of 2002, a LANL worker observed an electrical arc while reconnecting magnet lead cables to the power supply. He and his coworkers had been following an HCP to troubleshoot the equipment. During the troubleshooting, the capacitor stored up energy; it was this energy that caused the arc. Workers needed to revise the HCP to address how to verify and maintain zero energy in the capacitor.
As a second example, in 2001, a radioactive source was incorrectly shipped from TA-53 to another facility at LANL. An inexperienced worker did not realize that the source was

radioactive material. Instead, he had the Packaging and Transportation Group pick up the material as if it were non-hazardous, non-radioactive. Remember that administrative controls for transferring radioactive material include following strict rules for labeling, marking, and shipping the material. In this case, the LIR did not clearly identify the requirement to characterize the materials before shipping. As a corrective action, the LIR had to be revised. The Packaging and Transportation Group also revised LANL shipping forms and supporting documentation.

Be conservative when setting up hazard controls

It is good practice to consider the "worst case" when establishing hazard controls for an activity. Past experiences may not be sufficient.

In 2001, TA-53 workers performing pump-maintenance work under an RWP discovered contamination on a worker's skin, clothing, and the area. Based upon past jobs, the RWP did not require ventilation controls or personal protective equipment. Unfortunately, in this case it appears that contamination spread two ways. First, ventilation fans and the opening of a roll-up door during work caused dry radioactive residue to become airborne. Second, ionized beta particles moved from one spot to another during decontamination. Had the work planners considered the "worst case," they may have imposed additional controls. In the future, they will ensure that ventilation fans are not present and that the roll-up door remains locked during such work. In addition, they will consider using a tent to confine the pump work. They will also wear anti-contamination clothing and respirators.

Have an RCT survey all items potentially exposed to the beam before removing them from the area

Remember to have an RCT survey and apply a release tag to all items that may have been exposed to the beam before taking them out of a radiological control area. In 2002, an employee did not verify that a flange from a secondary beam line was tagged for free release before transporting it to a public machining shop for machining. As a result of the procedure violation, LANL had to deploy health physics personnel to the machine shop to verify that no contamination was spread.

In a similar incident, contaminated copper pipe from TA-53 ended up at the Los Alamos County landfill. Personnel had not followed procedures to have an RCT survey and tag the pipe before it was removed from a radiological control area as trash. Fortunately, a portal monitor at the landfill sounded, alerting County officials to the problem.

In the spring of 2003, a truck leaving TA-53 set off the radiation alarm at the gate. The driver parked near the gate and RCTs surveyed the truck and its contents. They discovered that old fluorescent light ballasts in the truck bed were radioactive and had set off the alarm. The light ballasts had been removed from the primary beam line and were activated. Personnel did not follow procedures; the light ballasts should have been surveyed, tagged and released by an RCT before removing them from the primary beam line. Fortunately, our gate alarm served as the last line of defense and the ballasts did not leave Laboratory property.

Even if potentially radioactive material is not taken off Laboratory property, it must be surveyed, tagged, and released before it can be moved to an uncontrolled area. In 1998, two RCTs discovered a radioactive cesium iodide detector in a storage cabinet in Building 1. The

storage area was an uncontrolled area. There was no release tag on the instrument. The detector had been used in an experimental area, but it had been moved to Building 1 without following procedural requirements for an RCT to survey and tag it.

Pre-job safety and planning meetings serve as an effective hazard control

A review of operational experience at TA-53 from 1999-2002 shows that pre-job safety and planning meetings could have been established as a hazard control for as many as 44% of reportable incidents. It is good practice to hold pre-job safety and planning meetings to ensure that all personnel involved are aware of the hazards and controls for the work, responsibilities of the various workers, and other factors affecting safety. As an example, in December 2002, DOE personnel stopped work at TA-53 on an electrical project that several organizations, including sub-contractors, were involved in. DOE personnel were initially concerned that the Electrical Safety Officer who was grounding capacitors was not wearing adequate personnel protective equipment. He also did not have a hazard analysis or procedures for the work.

As line managers and safety professionals worked to resolve the concerns, they realized that the complex job involving multiple organizations and/or complex hazards needed more formal communications. In this case, the work involved more than one group and more than one electrical hazard classification. The work also took place over a span of time greater than one day. A pre-job safety and planning meeting helps ensure that everyone is ready to work safely.

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