

**UNIVERSITY OF NOTRE DAME  
RADIATION LABORATORY**

**SAFETY PROGRAM**

**Safety Coordinator: Laura Mortlock**  
Laura.Mortlock@nd.edu  
631-6117

**Director: Ian Carmichael**  
Carmichael.1@nd.edu  
631-4502

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## **Mission Statement**

The Notre Dame Radiation Laboratory (NDRL) is committed to conducting research in cooperative agreement with the United States Department of Energy (DOE) in an environment that insures the health and safety of our faculty, staff, students and visitors. To that end, the NDRL Safety Committee shall:

- Promote the safety validation of all laboratories by conducting systemic reviews of joint assessment reports and provide assistance to resolve outstanding issues identified during the Joint Assessment.
- Evaluate injuries and incident reports as necessary, and provide recommendations to the unit leader to prevent similar incidents.
- Promote safety through the development and periodic updating of a comprehensive department safety plan.
- Inform and educate faculty, staff, students and visitors regarding health and safety issues, new standards, and research findings.

## **Responsibility**

Per the **Laboratory Integrated Safety Plan (LISP)**, safety is everyone's responsibility. All members of the University community should be thoroughly familiar with their safety responsibilities, strive to follow safety practices at all times, act proactively to prevent accidents and injuries, communicate hazards to supervisors, and be prepared for emergencies that may occur in the workplace or on campus. The major responsibilities each party has in connection with the Health and Safety Policy are as follows:

### **President**

1. Assume overall responsibility for the implementation of the Health and Safety Policy at all facilities under University control.

### **Provost, Executive Vice-President, Vice-Presidents and Deans**

1. Responsible for implementing and enforcing this policy in all facilities and operations within their respective jurisdictions.
2. Demonstrate leadership and commitment to safety.

### **Department Chairs and Directors**

1. Communicate and implement the Health and Safety Policy and its requirements to faculty, staff and students.

2. Charge those individuals under their management with the authority to implement appropriate health and safety policies, practices and programs, and to take corrective actions when necessary.
3. Implement and communicate procedures that direct all department personnel, including but not limited to principle investigators, supervisors, regular and temporary employees, visiting professors and students to obtain required safety training before they work with hazardous chemicals, biohazardous agents, radiation, or other physical/mechanical hazards in their working environments. Documentation for the completion of all training requirements shall be maintained by department chairs, directors, or designee(s) as appropriate.
4. Determine that health and safety program needs (e.g. training, protective equipment and corrective measures including noncompliance items identified in safety audits) have adequate funding.
5. Assign a responsible individual to serve as the Department Safety Coordinator and establish a Department or Building Safety Committee, and provide them with appropriate time and resources to administer their responsibilities. The Department Safety Coordinator, in consultation with Risk Management and Safety, may determine that the size of the department or the nature of the risks typically encountered, are such that an active safety program can be implemented without appointment of a Safety Committee.
6. Assign a Department Training Officer to conduct time critical safety training, if warranted.

#### **Faculty, Principle Investigators, Supervisors**

1. Implement the University's Health and Safety Policy and all other applicable University health and safety practices and programs.
2. Require all staff members and students under their direction to obtain and maintain required safety training prior to initiating work for which that training is applicable.
3. Ensure that workplaces, laboratories, and equipment under their direction are safe, well-maintained, and in compliance with the Health and Safety Policy and other applicable University health and safety practices and programs.
4. Meet all safety needs for units/departments (e.g. engineering controls, training, personal protective equipment and corrective measures for noncompliance items identified in safety audits).
5. In a research setting, assign a laboratory safety coordinator to assist in implementing the Health and Safety Policy, if the size of the research group or activities warrants the need.
6. Establish Standard Operating Procedures (SOPs) when required for specific research involving high hazard chemicals (e.g. T-butyl lithium), radiation or biohazardous agents and train all lab personnel on lab specific SOPs and high hazards.

#### **Department or Building Safety Committee**

1. Promote safety at the department level and provide a forum for departmental participation in the overall University Health and Safety program.

2. Act as the conduit for information exchange between employees and department leadership or Risk Management and Safety regarding unsafe acts or conditions, or new safety initiatives.
3. Ensure that work related injuries and illnesses and unsafe acts and conditions are properly and timely reported, investigated when appropriate, and findings reviewed with Risk Management and Safety.
4. Assign a contact to work with appropriate campus departments to coordinate fire drills, first aid and CPR training, emergency action training and other general safety training for the Department/Building.

### **Department Safety Coordinator**

1. Serve on the Department or Building Safety Committee (where applicable) and assume additional responsibilities as assigned.
2. Assume the same responsibilities as the Department or Building Safety Committee when Risk Management and Safety determines that a committee is not required in order to implement a safety program for the unit.
3. Act as the advocate for safety within the department.
4. Assist in implementing the University's Health and Safety Policy within the Department by encouraging and making employees and researchers aware of the required safety training, safety practices and compliance responsibilities with respect to applicable safety regulations.
5. Check annually or more frequently the First Aid Kits in the departments or labs and replenish supplies.
6. Maintain records and investigative documents related to injuries, illnesses and unsafe acts and conditions reported within the department.

### **Research Group Safety Coordinator**

1. Act as the advocate for safety within the Research Group.
2. Assist in implementing the University's Health and Safety Policy within the group by encouraging and making laboratory personnel aware of the required safety training, safety practices and compliance responsibilities with respect to applicable safety regulations.

### **Risk Management and Safety Department (RMS)**

1. Advise the University community of its responsibilities regarding the Health and Safety Policy.
2. Prepare documents and guidelines for programs to ensure individual and University compliance with relevant environmental health and safety laws, regulations, policies and guidelines.
3. Recommend programs and actions for compliance.
4. Consult with external entities and regulatory agencies on behalf of the University.
5. Develop and maintain effective programs including safety training for occupational health, hazardous materials management, radiation safety, general safety, workshop and studio safety,

accident and fire prevention, biological safety, and disaster preparedness and emergency response.

6. Conduct train-the-trainer training for department safety training officers so that they may provide training as needed in between the regularly scheduled safety classes offered by Risk Management and Safety.
7. Provide guidance and technical assistance to supervisors and managers in colleges, schools, departments and other work units to identify, evaluate and correct safety hazards.
8. Review standard operating procedures (SOPs) for the safe use of high hazard chemicals, radiological and biological substances and class IIIB or IV lasers.
9. Conduct investigations of employee, student and visitor accidents and injuries and initiate corrective actions if warranted. Assist safety committee representatives with investigations if requested.
10. Monitor compliance with health and safety statutes and regulations and University health and safety policies, programs and guidelines.
11. Note instances of noncompliance and recommend improvements; submit these to the appropriate vice presidents, deans, directors, department heads and principal investigators who are responsible for schools, divisions, departments, laboratories and service units.
12. Manage hazardous waste disposal services.
13. Execute responsibilities involving inspection and enforcement delegated by any standing University Safety Committee (e.g. the Biosafety Committee, the University Radiation Control Committee).
14. Review self-audits.

### **Risk Management and Safety Director**

1. Direct operations, services and safety programs of the Risk Management and Safety Department.
2. In cases of imminent danger to life or health, order the cessation of hazardous activity until the danger from such a condition is abated or adequate corrective measures have been taken.

### **Employees and Students**

1. Comply with this policy and all other University health and safety practices and programs.
2. Maintain classrooms, work and laboratory areas safe and free from hazards.
3. Attend required health and safety training.
4. Notify a supervisor or instructor of any safety hazards in the workplace, classroom, or laboratory. If supervisor or instructor fails to address unsafe conditions or act, notify RMS of the hazard.
5. Keep informed of conditions affecting their health and safety.
6. Report all accidents and injuries to your supervisor or instructor.
7. Stop working or performing your assignment if employee or student feels he/she is in a dangerous work environment or classroom situation. Every employee or student has the right

and responsibility to stop what they are doing to address the safety concerns with their supervisor or instructor.

### Responsibility Table

When	Task	Responsible Party
First 14 days	Verify coworker participation in RMS safety.	PI
First 14 days	Ask coworker to read the NDRL Safety Program.	PI
First 14 days	Have coworker read and sign the appropriate safety compliance forms waivers and personal protection forms.	PI
First 14 days	Instruct coworker on potential hazards and PPE policy of your lab.	PI
Monthly	Ensure that monthly inspections of eyewash stations.	Custodian-hallway Lab members- labs
Monthly	Ensure fire extinguishers inspections are conducted.	Assistant Director
Semi-annually	Ensure that the lab first aid kits have been checked and restocked.	Inventory Coordinator
Annually	Ensure coworkers have completed RMS refresher training.	Assistant Director
Annually	Perform RMS safety self-audit of lab.	Safety Committee
As new hazards are introduced (change in scope of work, new chemical usage, new equipment, scaling up experiments, etc.)	Review and compare the lab's current PPE Assessment for the new hazards and the potentially affected body part(s). -If hazard(s) and affected body part(s) are listed, no changes needed. -If hazard(s) and affected body part(s) are not listed, a new PPE Assessment form and PPE Certification form needs to be completed.	PI
As new hazards, equipment, PPE are introduced	Notify RMS of the changes in lab use or design to verify appropriate controls and PPE protection are in place.	PI/Safety Committee
As Needed	If PPE requirements change, instruct coworkers and have them sign PPE certification form.	PI
As Needed	Update safety forms to be kept on file for each coworker.	PI

## Laboratory Specific Protocol Requirements

If a lab has any of the hazards identified below, the PI or his designee will develop a Laboratory Safety Protocol specific to those hazards

1. Sealed, non-sealed or machine produced radiation.
2. Laboratory is Bio-safety level (BSL) 2 or 3.
3. Use of controlled substances.
4. Use of lasers 3B or 4.
5. Conducts entry into confined spaces
6. Performs maintenance on equipment- may require lockout/tagout.
7. Experiments involving exposed electrodes with voltages above 50V.
8. Other hazards as identified by the LSC or Risk Management and Safety.

## NDRL Safety Rules and Regulations

Dangerous situations in the practice of experimental sciences cannot be entirely avoided on account of the very nature of these research disciplines. However, reasonable and sensible precautions will minimize injury and property damage. Many laboratory accidents can be attributed to carelessness and a lack of familiarity with accepted safety practices. **Fostering a culture of safety is the responsibility of all laboratory members.**

**It is not possible to anticipate every possible hazardous situation to which you may be exposed during your work at the NDRL. Because of this, these safety rules are not complete.** You are required to read and understand all the available safety procedures and policies that apply to the laboratories in which you will be working. These are available through the [Risk Management and Safety webpage](#). Other links to safety are found in the LISP Assessment Questions and Resources ([All in One Resource Document](#)).

1. [Laboratory Safety Manual \(LSM\) with Chemical Hygiene Plan \(CHP\)](#)
2. [The Laser Safety Manual](#)
3. [The Radiation Safety Manual](#)
4. [The Personal Protective Equipment Policy](#)
5. [Machine Shop Policy](#)
6. [Electronic Safety Procedure](#)
7. [Handling Time Sensitive Materials](#)
8. [Material Safety Data Sheets \(MSDS\)](#)
9. [Lock, Tag, Try \(Lockout Tagout Procedures\)](#)

The following safety rules address the more commonplace and dangerous laboratory situations. When there is not a stated rule that applies to a given circumstance, it is the responsibility of the laboratory worker to 1) inquire about the possibility of hazards, 2) ask for advice concerning safety devices and procedures, and 3) use common sense. **Always** consult your supervisor before you undertake experiments new to you. Research involving the new and unknown can carry the possibility of unexpected and dangerous outcomes. It is prudent to perform new experiments on the smallest possible scale to observe unexpected or dangerous outcomes. Casual regard for routine procedures can also result in damage and injury. **Never underestimate risks, even in routine and familiar situations.**

***No experiment is so critical that one cannot take the time to perform it safely.***

1. **All new NDRL personnel are to complete the initial General Lab Safety Training and Portable Fire Extinguisher Training online before beginning any laboratory work.** Please see the Assistant Director for access to these courses.
2. It is the responsibility of the worker to complete the online General Lab Safety Refresher Training and Portable Fire Extinguisher Training on an annual basis.
3. All workers must consult with their faculty supervisor regarding the specific Personal Protective Equipment (PPE) policy of the laboratory.
4. The NDRL is a government-owned building, and is locked outside of business hours. Coworkers will be given a key as their supervisor sees fit. Each key holder must sign a *Key Holder Responsibility Agreement*.
5. Students may not commence a program of laboratory work or engage in, assist, or cooperate with others in any laboratory activities of any kind without the knowledge and consent of the faculty in charge.
6. Laboratory work involving potentially hazardous procedures cannot be carried out unless responsible assistance is immediately available nearby in the event of an accident. Avoid working alone in the building. Make sure that another person is aware of your presence and location in the building. Do not work in the laboratories alone with hazardous materials.
7. There are no fixed gas monitoring devices in the Radiation Laboratory. It is advised that you use a portable monitor when working with gases.
8. All fires, explosions, spillage of dangerous chemicals, release of toxic fumes, etc., must be reported promptly to RMS (Security Dispatch), the faculty member in charge and to all other persons who might be affected by such as occurrence. Security Dispatch from



your cell phone: 631-1555. From a campus phone: 1-5555. The worker(s) involved will need to complete the appropriate incident reports.

9. Workers must know how to access the laboratory's Material Safety Data Sheets (MSDS) in either electronic or hard copy format.
10. Each worker must know the location of fire extinguishers, safety showers, eye-wash stations, and first aid kits nearest to the areas in which they work.
11. All laboratories must have contact information posted externally and visibly.
12. Minors are prohibited from working alone in any Notre Dame laboratory and must be attended by a senior coworker.
13. Hose connections from water-cooled condensers to drains must be tightly secured (wired or clamped) to the condenser to prevent accidental detachment if left unattended.
14. Broken glass must be promptly collected and placed in appropriate cardboard containers for disposal. Likewise, sharps must also be disposed of in appropriate containers. Both container types are available from the stockroom (room 102)
15. Paper, broken glass, stoppers, rubber tubing, etc., are to be kept out of sinks at all times to minimize the possibility of clogged drains. Such items are to be kept away from areas where they might fall into sinks.
16. Practical jokes, horseplay, and excessive noise (as from radios) are forbidden.
17. Electronic devices with earpieces or headphones should not be used when one is alone in the lab as it may compromise the wearer's ability to hear fire alarms or other alarms associated with hoods and other equipment.
18. Gloves worn in the laboratory must be removed before leaving the laboratory.
19. Eating, drinking, chewing gum and cosmetic application are not permitted in any laboratory.
20. Smoking is not permitted in the NDRL.
21. Hood sashes must be closed when hoods are not in use. Closing the hoods promotes energy savings, and guards you against something going awry.

22. Safety glasses, suitable goggles, or face shields must be worn in all areas where chemicals are stored or handled, or where hazardous procedures are carried out. Individuals who wear eyeglasses must wear safety glasses or goggles over these, or obtain prescription safety glasses from Eyemart Express (215 E. University Drive, Granger, IN) at no cost to you. Take your prescription to the Inventory Coordinator, and she will arrange to obtain the glasses. Contact lenses should not be worn where chemical vapors are present or a chemical splash or chemical dust is possible. If, however, an individual chooses to wear contact lenses in the laboratory, chemical splash goggles must be worn.
23. Visitor eye protection should be made available at the entrances to all laboratories.
24. In all experiments where explosion, implosion, or violent reaction is possible, the operator and neighboring workers must be protected by safety shields.
25. Appropriate footwear is required in the lab at all times. Shoes that cover the entire foot must be worn. Flip-flops, sandals, open-toed shoes, ballet slippers, and related footwear is not allowed.
26. Equipment with mechanical hazards, such as rotational motion, nip points, cutting, shearing, punching and forming mechanisms, require guarding to protect against the respective hazard(s).
27. If flooding occurs, determine the source of the flooding and turn the water off. A wet vacuum is available in room 025. Please do not place vacuums in standing water. Mops are available in the janitor's closet on each floor.
28. Fire extinguishers are located throughout the building. RMS and our Emergency Plan strongly encourages evacuation if there is a fire. However, there may be fires small enough to extinguish with a fire extinguisher. Fire extinguisher use must be reported to your P.I. so that he/she can report it to RMS using [Incident Report and Management](#) tool on the RMS website.
29. Alcoholic beverages are not to be consumed in the building.

## **Safety Bulletins**

From time to time, safety bulletins will be distributed. Safety bulletins can come by email or directly to the individual as appropriate.

## Radiation Safety

Instructions concerning the use of radiation sources are contained in the University's [Radiation Safety Manual](#). Some general remarks applicable to all Laboratory personnel are listed below.

- 1. All personnel who intend to use the sources must undergo Radiation Safety Training provided by RMS.**
2. After attending the initial training, it is the responsibility of each worker to complete the online Radiation Safety Training annually.
3. Each radiation source has a designated custodian who is responsible for the operations of that source. The custodian authorizes users to operate the radiation source after the worker has been trained for that particular source.
4. Workers who intend to use sources need to obtain a radiation badge from the Inventory Coordinator, which is to be worn whenever the user is in a designated radiation area.
5. Persons who have not received radiation training or are not authorized to use a particular source should not enter source areas unless accompanied by authorized personnel.
6. Do not attempt to enter an accelerator vault when its red light is on, unless an emergency makes it necessary. Entry in these circumstances will trip the interlocks and force shutdown of the accelerators.
7. All problems involving any of the radiation sources should be brought to the attention of the custodian of the source or a member of the NDRL Safety Committee.
- 8. Each radiation user is responsible for reading the Radiation Safety Manual.**

## Laser Safety

Each Laser Operation Area (LOA) in the NDRL consists of a Laser Controlled Area (LCA) and an Operator Area (OA). In the LCA, there is significant risk of exposure, and this should be separated from the OA by means of passive shielding such as walls, drapes and other approved dividers. In some LOAs, the OA is not distinct from the LCA, and the entire room must be considered as an LCA. Warning lights: a three-phase system is being implemented at the entrance points to the LOAs.

- Green: System off. No laser hazards in the LCA.
- Yellow: Laser is on standby, and shutter is in its closed position. Entrance is limited by permission of the authorized user that is signed in for the current time period.

- Red: Laser is ON (operating) and the entrance to the LCA is limited only to authorized users. No spectators or collaborators can enter without approval of the user.

**Standard Operating Procedure.** There is a Standard Operating Procedure (SOP) in each OA indicating the type of laser in the attached LCA and the proper goggles to be worn by users and spectators who might enter the controlled area. The SOP should also indicate whether goggles are required in that particular OA.

Lasers can cause eye damage by exposure to the beam or through specular reflections. Even diffused reflections from high-power lasers can permanently damage the eye. In addition, lasers can burn exposed skin, and ignite any flammable materials within their beams. There are often additional hazards such as high voltages in LCAs, and excimer lasers using toxic gases.

Instructions for laser use are given in the University's [Laser Safety Manual](#). Below are general rules for Laser Safety.

1. **All workers who intend on using a Laser are required to read the Standard Operating Procedure for that laser before use.**
2. Each new laser user must have an initial eye exam, arranged through the Assistant Director.
3. Each LOA has a designated custodian, who is responsible for the operations of the lasers in the LOA. The custodian authorizes users to operate the laser after they have been trained in its operation.
4. Passive protection in the form of room dividers, bench-top optical shields and enclosed light paths are employed in the Laser Controlled Areas. Such passive devices should not be moved without the prior knowledge and consent of the NDRL Safety Committee. If any passive protection is moved in order to make room for experimental apparatus, the user should replace it with an equivalent optical shield.
5. The proper laser goggles must be worn in the LCA when the laser is on standby or the laser is operating. Proper goggles should be indicated in the SOP.
6. If possible, leave the lights on during operations. This decreases the likelihood of accidents. Additionally, darkness increases the eye's vulnerability to stray laser beams.
7. The users should avoid placing their heads in the plane of the laser beam. Never deliberately look directly at the laser beam.
8. When the users leave the area temporarily, the laser should be put into a standby mode with the beam shutter in the closed position. The yellow warning light will then be lit.

9. If the permanent beam stops have to be temporarily replaced or removed, care must be taken that the replacement is not flammable, especially with infrared beams.
10. The back of dielectric mirrors should be shielded since they can transmit a significant fraction of incident laser light.
11. Accidental exposure should be reported to the PI, who will initiate the injury/illness policy and inform the Assistant Director. An eye exam is required in the event of an accidental or suspected exposure to the eye.
12. A final eye exam is offered to each laser user at no cost to them on termination of employment.
13. The laser user is responsible for reading the Laser Safety Manual and the SOP of each laser area he or she will use.
14. Any problems concerning a particular laser should be brought to the attention of that laser's custodian or a member of the NDRL Safety Committee.

## **Electrical Safety**

In general, all electronic/electrical problems with the equipment or building facilities should be referred to the Supervisor of the Electronics Shop. The supervisor should also be consulted before requisitioning any electronic component.

## **Chemical Safety and Hazards**

Other than the chemicals listed below, it is beyond the scope of this manual to outline specific procedures for the safe use and disposal of specific chemicals. It is the responsibility of all workers to ascertain, to the extent possible, the properties and safe practices needed to work with any chemical. Please refer to the University's [CHP](#).

Specific information pertaining to the NDRL follows.

**Ether and Other Peroxide Forming Chemicals.** There is an ever present danger of explosion from peroxides which may be formed by the oxidation of uninhibited ether or from other compounds having an ether group. **Precautions for peroxide forming chemicals can be found in the [All in One Resource Document](#) under Storage and Disposal of Time Sensitive Materials.**

**Flammable Liquids.** Because of the ever present danger of fire, the amount of flammable liquids on hand must be minimal at all times as governed by actual need. They are to be stored

in ventilated storage cabinets- **not** on bench tops. When dispensing flammable liquids from bulk containers, the container, the pump and the flammable cabinet shelf needs to be bonded and grounded to the grounded flammables cabinet. **More detailed information on flammable liquids can be found in the [All in One Resource Document](#) under Flammable Liquids and Compressed Gases.**

**Safe Handling of Compressed Gas Cylinders.** The potential for a serious incident resulting from the neglect of safe handling procedure for compressed gas cylinders is high. Should a damaged cylinder valve or regulator result in uncontrolled compressed gas leakage, a cylinder can become a projectile and blast through walls or anything else in its path. For your own safety and that of others, please observe the following general precautions in the [All in One Resource Document](#).

**Hazards of Soft Tubing Failures.** Soft tubing failures can cause flooding or the escape of gases, creating a hazardous situation which could be avoided if the users follow the standard practice of turning the gases off at the house of cylinder valves. Soft tubing should not be left under pressure and unattended. Please observe the following precautions.

1. When you finish using a torch or burner, **close the house valves**. It is **not** sufficient to simply close the burner valves.
2. When you finish using gas from a cylinder, **close the cylinder valve**. To the extent practical, do not leave the regulator and the soft tubing under pressure while unattended and not in use.
3. If the soft tubing must be left under pressure and unattended, **secure the ends with hoseclamps**.

**Transite Panels.** The “transite” panels which are used throughout the NDRL as partition paneling are made of a stable composition of asbestos and cement. They present no health or environmental hazard. However, if a panel is drilled or sawed, some of the bound asbestos may be released into the atmosphere constituting a violation of OSHA and DOE regulations. Therefore, drilling, sawing, or any other operation on any of these panels is prohibited.

If you have an assignment which necessitates work on these panels, please contact the Assistant Director.

**Mercury.** The use of Mercury has been phased out in the NDRL. However, if a need arises that only a mercury system can fulfill, the following restrictions and procedures shall apply.

1. DOE requires that a secondary container for mercury be used. This means any type of container containing a significant amount of mercury which is subject to breakage or leakage should be protected by a secondary container.

2. Where the operating apparatus does not permit the use of a direct contact secondary container, it is necessary to achieve the same objective by having a tray beneath a primary container. If you need assistance in providing a secondary container, the Inventory Coordinator will assist you.
3. A vacuum cleaner equipped with a mercury trap and a mercury spill kit are available in the stockroom.
4. In the event that any mercury is spilled into a drain, the Assistant Director is to be notified immediately in order that the drain trap may be opened and the spilled mercury recovered.

**Chemical Accumulation and Disposal.** It is recommended that all researchers make a concerted effort to reduce quantities of all chemicals that have collected in laboratories but are not being used. The researcher should determine which chemicals should be placed on stockroom shelves for future use and which chemicals need to be disposed. The link to the Hazardous Waste procedure is found in the [All in One Resource Document](#). If you have questions regarding disposal, RMS is available for consultation at 631-9144.

**Other Chemical Safety Requirements.** Listed below are a few other safety considerations when using chemicals.

1. All chemical reactions are to be carried out in a fume hood or appropriate apparatus. Hood sashes should be opened only to the minimum extent necessary when work is being conducted in them.
2. Reactions in progress that are in any way chemically or mechanically hazardous may not be left unattended.
3. Well-documented, small-scale reaction may be left unattended; written notice of such reactions must be posted outside of the laboratory entrance.
4. When handling hazardous chemicals, the operator must be protected by a lab coat (or apron), eye protection and suitable gloves. Consult the [Glove Compatibility Chart](#) for proper glove selection.

## **Glass Vacuum Systems**

Extreme caution should be taken whenever a leak is noted in a glass vacuum system, particularly when it includes a liquid nitrogen trap. The trap may contain some liquid oxygen

and minute amounts of organic material constituting a very dangerous combination. To avoid explosions in vacuum systems, the following precautions are to be taken.

1. Clean traps periodically as needed.
2. When a sizable leak occurs in the system, turn off pumps, remove the liquid nitrogen from the trap, and bring the system up to atmospheric pressure.
3. Because liquid oxygen and other hazardous elements or compounds may be present in the traps, vent while warming the traps.
4. Always allow for sufficient volume expansion for any gas that may be contained in the trap.
5. In the event that a system contained any highly flammable or explosive compounds, special instructions should be given by the research scientist prior to shutting down the system or in the event of any malfunction of the system.
6. Install warning signs on all vacuum lines with refrigerated traps to remove refrigerant before admitting air.

## **Glassware**

1. Do not use cracked or starred glassware. Glassware used for vacuum distillation (especially round-bottom flask) should be inspected carefully before use.
2. When using ground-glassware, disconnect all joints immediately after use to prevent "freezing."
3. Heavy pieces of glassware should be supported with clamps and also with bottom support using items such as lab-jack, tripod, or ring.
4. Vacuum desiccators and Dewar flasks must be protected by adhesive tape or netting.

## **Machine Shop**

Only qualified shop personnel whose duties necessitate use of the Machine Shop Equipment are permitted to operate such equipment. Anyone working in the Machine Shop does so only with the approval of the Machine Shop Manager. More information can be found in the [Machine Shop Policy](#) procedure.



## **lass Shop**

As with the Machine Shop, only qualified personnel are permitted to use the equipment in the Glass Shop. Any workers wanting to use the Glass Shop does so under the supervision of the Manager of the NDRL Glass Shop.

## **Lock, Tag Try (Lockout-Tagout System) Procedure**

**Purpose.** This procedure establishes the requirements for lockout or tagout to insure the safety of all those engaged in the repair or maintenance of equipment or machinery. Its implementation will insure that all potential energy sources will be isolated so that necessary service can be performed with safety from the unauthorized restoration of energy. Energy sources can be electrical, mechanical, hydraulic, thermal, or radiation. Complete information can be found in the RMS program for [Lock Tag, Try](#).

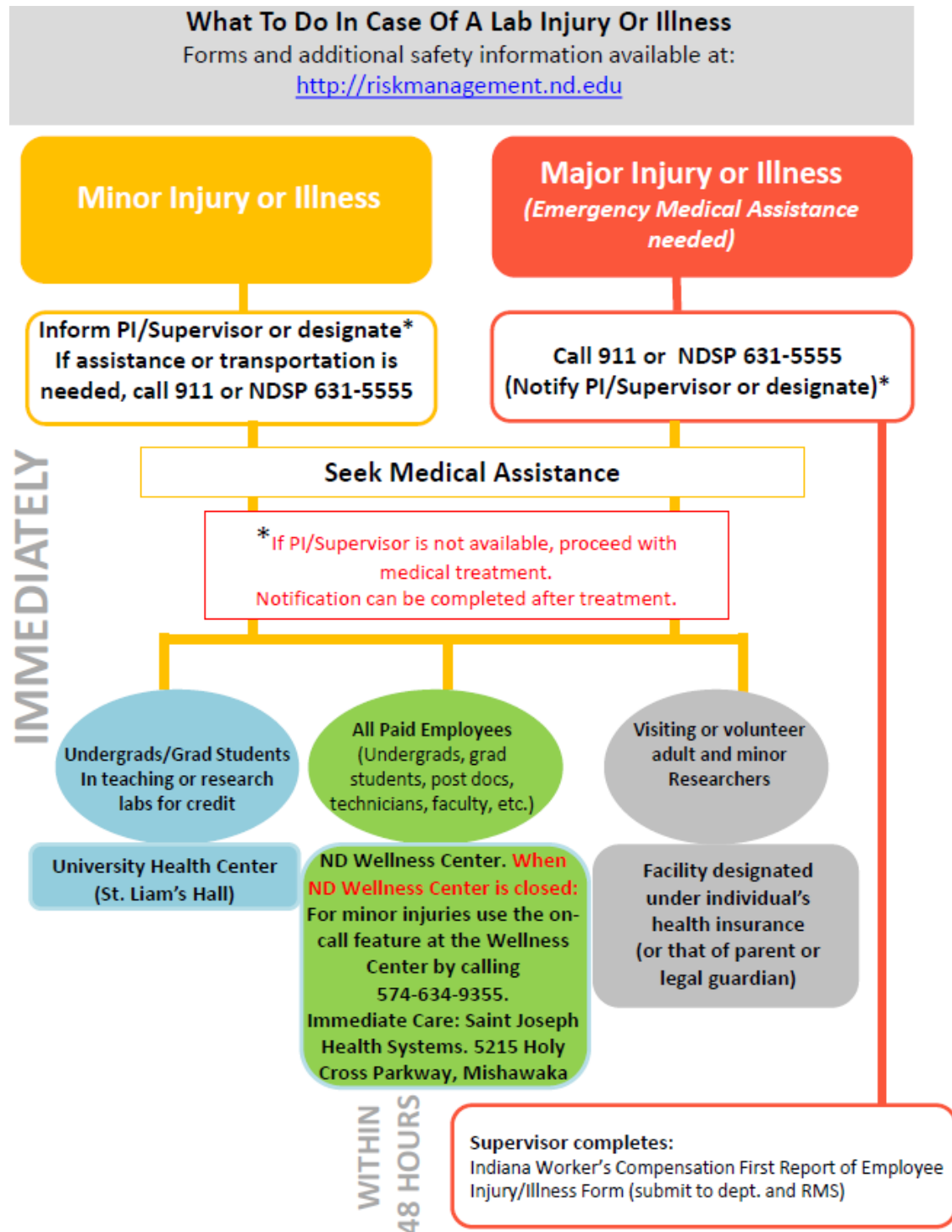
## **Volunteers and Minors**

Risk and Insurance Management, in collaboration with the Office of General Counsel, prepares Waiver, Release and Indemnification Agreements for individuals participating in voluntary events, activities, programs, and travel supported by the University. Agreements are individualized and may be requested by completing the [Waiver, Release, and Indemnification Request Form](#).

**Programs Involving Minors.** Departments or individuals with programs which involve children are required to follow the Protection of Children Policy and the criteria outlined therein. Waivers, which must be signed by a parent or legal guardian, are available on the [Protection of Children Website](#).

Children volunteering or shadowing in science laboratories must follow the Laboratory Policy; safety training and protocol is required and waivers should be signed by a parent or legal guardian: [Children in Laboratories](#).

## Procedure in Case of Injury, Illness, or Near Miss



## Incident Reporting and Management

The following scenarios are reportable occurrences.

[Safety Incident Report Form](#). Report a work-related injury to a faculty/staff member, student, contractor or temporary employee.

For non-paid students: In addition to Safety Incident Report Form, fill out the [Supervisor's Report of Injury to Health Center](#) and send to Health Center with student.

[Good Catch \(Near Miss\) Report Form](#). Report a safety concern on campus or situation that could have, but did not, result in an injury or property damage.

[Environmental Incident Report Form](#). Report the release of chemical, biological, radioactive materials, or petroleum products to the air, water, or ground.

[Investigation Complete Form for Safety, Environment, Good Catch](#). Used by individuals to document a completed investigation in the OnBase system.

[Investigation Approval Form](#). Used by individuals to approve an investigation in the OnBase system.

[Action Item Complete Form](#). Used by Action item owners to mark an action item complete and to upload supporting evidence.

Please see the [Incident Management Tool flowchart](#) for further instruction.

## Miscellaneous Lab Safety Forms

The following forms must be completed for each new lab worker in at NDRL.

[PPE Certification Form](#)  
[Safety Compliance Form](#)

Additional Forms used in NDRL

[Baseline Eye Exam Form](#)

[Equipment Training Acknowledgement](#). Signed by lab personnel to acknowledge they've been trained on Standard Operating Procedure on a specific piece of equipment.

All of these forms can be found on our website (rad.nd.edu) under "Safety."