School of Chemical Sciences Chemical Hygiene Plan

1. Purpose

The School of Chemical Sciences (SCS) Chemical Hygiene Plan (CHP) establishes the requirements and responsibilities necessary to maintain a safe and healthy laboratory environment for all faculty, staff, students, and visitors.

This document supplements the Division of Research Safety (DRS) Laboratory Safety Guide by providing laboratory safety expectations specific to SCS facilities. Together, these documents support compliance with the Occupational Safety and Health Administration (OSHA) Laboratory Standard (29 CFR 1910.1450), University policies, and other applicable federal and state regulations.

The CHP is reviewed annually by SCS Safety personnel. Proposed revisions are submitted to the SCS Director for review and approval before implementation.

2. School Facilities

The School of Chemical Sciences occupies five interconnected buildings on the University of Illinois Urbana-Champaign campus:

- Noyes Laboratory (NL)
- Chemistry Annex (CA)
- Davenport Hall (DH)
- Roger Adams Laboratory (RAL)
- Chemical and Life Sciences Laboratory (CLSL) Building A

Facility Maintenance Requests

Laboratory personnel should submit a work order through **Reaction** for non-emergency building or laboratory maintenance issues.

These include:

- Fume hood performance concerns
- Eyewash or safety shower concerns
- Electrical outlet and lighting concerns
- Plumbing concerns
- General facility maintenance requests

Questions regarding maintenance requests should be directed to the SCS Facilities and Safety team at **scs-facilities@illinois.edu**.

Facility Emergencies

For emergencies involving building infrastructure, including significant water flooding, passengers stuck in elevator or other afterhours and weekend emergency's, (4:30pm to 8am) contact Public Safety at 217-333-1216.

After contacting Public Safety, email the SCS Facilities and Safety team so they can assist with coordination and follow-up.

3. Roles and Responsibilities

Principal Investigators and Laboratory Supervisors

Principal Investigators (PIs) are responsible for ensuring that laboratory operations are conducted safely and that appropriate measures are in place to protect all individuals working in or entering their laboratories.

Faculty members, laboratory supervisors, and individuals with supervisory authority shall:

- Maintain a safe laboratory environment.
- Ensure compliance with university policies and applicable safety regulations.
- Develop, implement, and maintain a Laboratory Safety Plan.
- Identify laboratory hazards and establish appropriate controls.
- Ensure laboratory personnel receive required safety training before beginning work.
- Provide and enforce the use of appropriate personal protective equipment.
- Maintain laboratory equipment in safe operating condition.
- Maintain accurate laboratory information within DRS safety management systems.
- Review laboratory safety documentation annually and update it whenever laboratory operations change.

Laboratory Safety Officer

Each laboratory is encouraged to designate a Laboratory Safety Officer (LSO) or Laboratory Safety Contact to assist the Principal Investigator in implementing the laboratory safety program.

Typical responsibilities include:

- Maintaining Standard Operating Procedures.
- Coordinating laboratory-specific training.
- Monitoring routine laboratory safety practices.
- Assisting during laboratory inspections and audits.
- Serving as the primary contact for SCS Safety and DRS.

Designation of an LSO does not relieve the Principal Investigator of responsibility for laboratory safety.

Laboratory Personnel

Every individual working in an SCS laboratory shares responsibility for maintaining a safe research environment.

Laboratory personnel are expected to:

- Complete all required safety training.
- Follow laboratory policies, procedures, and Standard Operating Procedures.
- Wear required personal protective equipment.
- Use engineering controls properly.
- Report hazards, incidents, injuries, unsafe conditions, and near misses immediately.
- Participate in maintaining a clean, organized, and safe laboratory.
- Stop work and seek guidance whenever uncertain about a procedure or hazard.

Chemistry Joint Safety Team

The Joint Safety Team (JST) supports the School's commitment to continuous improvement in laboratory safety by:

- Promoting safe laboratory practices.
- Reviewing laboratory incidents and identifying trends.
- Recommending improvements to laboratory safety programs.
- Supporting departmental safety initiatives.
- Encouraging communication between researchers, faculty, and safety staff.

Division of Research Safety

The Division of Research Safety provides institutional oversight and technical support for laboratory safety programs by:

- Managing laboratory safety management systems.
- Providing hazardous waste collection and disposal services.
- Conducting annual laboratory safety audits.
- Investigating laboratory incidents and assisting with root cause analyses.
- Providing consultation, regulatory guidance, and safety training resources.

4. Laboratory Safety Plan

Each laboratory must maintain a current Laboratory Safety Plan (LSP) that identifies laboratory-specific hazards and documents the procedures used to minimize risk.

The Laboratory Safety Plan serves as the laboratory's Chemical Hygiene Plan under OSHA's Laboratory Standard and should reflect the actual operations performed within the laboratory.

The plan shall address hazards associated with:

- Hazardous chemicals
- Biological materials
- Recombinant or synthetic nucleic acids
- Radioactive materials
- Lasers
- Physical hazards
- Specialized equipment
- Other laboratory-specific operations

The Laboratory Safety Plan shall be reviewed at least annually and updated whenever personnel, procedures, equipment, or hazards change.

5. Training Requirements

No individual may perform laboratory work independently until all required safety training has been completed.

At a minimum, laboratory personnel shall:

- Read the DRS Laboratory Safety Guide.
- Read the SCS Chemical Hygiene Plan.
- Pass the SCS Safety Examination.
- Complete all required DRS online safety training.
- Complete laboratory-specific safety training.
- Review laboratory Standard Operating Procedures.
- Review the Building Emergency Action Plan.
- Demonstrate an understanding of applicable laboratory hazards before beginning work.

Training shall be appropriate to the hazards present and include instruction on:

- Hazard communication
- Chemical safety
- Biological safety
- Radiation safety
- Laser safety
- Physical hazards
- Engineering controls
- Emergency procedures
- Personal protective equipment
- Waste management
- Laboratory-specific operating procedures

Training must be documented and updated whenever laboratory hazards or responsibilities change.

6. Prudent Practices for Laboratory Work

Equipment

Only use equipment in proper working condition and never use chipped or cracked glassware. All equipment and apparatuses should be securely mounted and free of strain.

Secondary Containment

Secondary containers should be placed under reaction systems. In the event a reaction should get out of control, or the container should break, the reactants and solvents will be contained and reaction materials may be easily recovered. If a fire is present, the container may prevent spreading of the fire.

Transfer of Chemicals

Never pour chemicals directly from storage containers into your reaction vessel. The use of an intermediate vessel such as a graduated cylinder, beaker, or pipette prevents accidental contamination, overfilling of vessels, or spills from occurring.

Proper Chemical Transportation

When transporting liquid chemicals in excess of 500mL through public corridors, always use a rubber bottle carrier or a cart with side rails of at least 2”. If the chemical needs to be transported to a different

building, try to utilize any interior building connections or the underground tunnels connecting RAL, Chem Annex, and Noyes to minimize potential environmental chemical release.

Heating Cautions

Always ensure an adequate vent when heating chemicals. Closed systems should not be heated unless performing controlled pressurized reactions in approved equipment.

Heating equipment such as mantles or fluid baths must be readily accessible and quickly removable in case of a runaway reaction.

Heating mantles are not recommended for heating flasks which contain highly flammable solvents, heterogeneous mixtures, or a reaction where the temperature needs to be carefully controlled. Heating mantles tend to form hot spots which can result in intense localized heating and/or fire. A stirred fluid bath with temperature control better regulates the temperature and eliminates the possibility of hot spots. The size of the heating bath must accommodate the size of the heated vessel.

Bunsen burners must never be used to heat flammable solvents. Before using a Bunsen burner, make sure that your coworkers are not using flammable solvents in the area. Always use a sparker to light a Bunsen burner. When work is completed, the Bunsen burner must be turned off immediately.

Vacuum Systems

Evacuated glassware poses a significant implosion hazard, which includes the potential of abruptly releasing glass shrapnel and the contents of the container. Implosion protection must be provided for all evacuated glassware without impairing visual inspection. This is often accomplished by wrapping with tape in a grid pattern that leaves the contents visible while guarding against flying glass should the vessel implode. Other commonly used protection methods include using plastic-coated glassware or using a plastic mesh to cover the glassware. All glassware must be inspected for defects and cracks before evacuating and discarded if any are found. Evacuated glassware should not be exposed to local overheating as it can weaken the glass and cause an implosion. Commonly evacuated vessels include:

- Desiccators
- Flasks: Never evacuate ordinary non-vacuum flasks, especially those with flat surfaces.
- Rotovaps: The body of a rotary evaporator and the receiving flask must both be implosion protected
- Dewar Flasks: Any equipment connected to a vacuum pump or the house vacuum system must be protected with a trap.

Blast Shields and Explosion/Implosion Hazards

Blast shields should be used when working with pressurized equipment or reactions that are known or suspected to be potential explosion/implosion hazards. Blast shields are a necessary supplement to the blast protection offered by the hood design. Hood sashes are made of laminated safety glass to be blast resistant. Some hoods are equipped with a blast vent on the top front of the hood which will be blown open during an explosion, thus providing an outlet for the blast force while directing it up and away.

Freezers/Equipment in Shared Labs

Freezers and other equipment that are used within a shared lab should be labeled with the PI's name so that in the event the equipment begins to malfunction or sound an alarm, the correct owner can be

quickly notified. If the PI's contact information isn't provided on the door sign, it should also be present on the equipment.

Preventing Flooding

Flooding from laboratory sinks and service connections has caused major damage to research equipment, furniture, and project records in the flooded areas and floors below. In addition to physical damage, the standing water creates significant electrical shock and slip hazards. Should a flood occur that is the result of negligence on the part of a researcher or staff member, the PI will be responsible for the costs of any repairs or item replacement. The following measures can be taken to minimize the chance of flooding.

Sink and Hood Gutter Drains

Ensure there are no objects or debris in the sinks or hood gutters that could restrict flow down the drains. If plugging the drain is required, ensure the water has an outlet and that the sink does not overflow.

Water Regulator

Water pressure regulators in the laboratories greatly reduce the chance of flooding because they maintain a steady flow of water regardless of the changes in water pressure in the building. Some of the faucets in the fume hoods in RAL South have water regulators installed. This is an example of what these regulators may look like:

To ensure the regulators will work properly when unattended:

1. Ensure the water valves in line with the regulators are fully open (this ensures the regulators and NOT the valves are controlling the flow).
2. Tighten down the wing nut on the "T" handles or screw to prevent loosening from vibration.
3. Occasionally flush debris from the regulators by momentarily increasing flow through them. This can be accomplished by backing out the "T" handle or screw at the top of the regulator.

Tubing and Connections

1. Do NOT use pure gum rubber tubing for water lines. Pure gum tubing is not designed to handle the pressures often found in building water systems.

2. Replace tubing before it becomes decomposed or brittle. Check tubing occasionally by bending sharply and looking for cracks.

3. Secure all tubing connections with clamps.

4. Use locking quick disconnects where needed and secure non-locking quick disconnects with clips.

Cold Rooms

Cold rooms are enclosed areas that are poorly ventilated. For that reason, volatile chemicals and cryogens should not be brought into cold rooms. Due to possible water condensation, floors in cold rooms can be slippery. The door to the cold room can freeze and the latch may become inoperable on the inside. Ensure proper function before closing the door and ensure the phone has a dial tone. In the event you become trapped within, use the phone in the cold room to call Campus Public Safety, 333-1216, or 911. It is suggested that you inform coworkers of your plans to work in the cold room prior to entering the cold room. Similar arrangements can be made with Campus Public Safety if a coworker is not available.

High Magnetic Fields

Researchers should be aware of the potential risks of working in areas with high magnetic fields, such as NMR facilities.

Magnetic (Ferrous) Objects

Magnetic (ferrous) objects should not be taken close (5-10 feet, depending on the magnet) to a high magnetic field. High magnetic fields can also cause permanent damage to watches, calculators, credit cards, cell phones, magnetic media (should not be taken inside the 20 gauss line), and other electrical equipment. Assume any piece of metal is magnetic unless proven otherwise. For more specific information concerning what types of objects should not be taken near a NMR instrument, contact the SCS NMR Staff.

Pacemakers and Medical Implants

Individuals with cardiac pacemakers should not cross the 5 gauss line of a high magnetic field. If you are not sure where the 5 gauss line is located, consult with the SCS NMR Staff. High magnetic fields could cause the pacemaker to function improperly or to stop working altogether. Individuals with other types of medical implants including clips and prostheses that contain ferromagnetic materials should not enter areas containing high magnetic fields. If uncertain about whether it is safe to use a NMR instrument due to medical devices/implants contact the NMR Staff.

Magnet Quenching

In the unlikely event of the magnet quenching (sudden release of gas from the Dewar), personnel should evacuate the area due to the risk of asphyxiation. A quench warranting evacuation would most likely be obvious by the noise of the escaping gas and clouds of vapor.

High Pressure/Hydrogenation Lab

The High Pressure/Hydrogenation Lab is located behind door P-8 in the penthouse on the 5th floor of South RAL. It is equipped with apparatuses designed for pressures up to 5000 psi that allow to perform chemical reactions safely at high pressures and temperatures. Please contact the Faculty Advisor listed on the HP/HL webpage for access and training.

7. Chemical Inventory

All chemicals stored in SCS research labs, teaching labs, and service facilities are tracked in the Chemical Safety EMS chemical inventory module. This inventory allows SCS to maintain compliance with all state and federal regulations, allows researchers and staff to easily track their own chemical storage, and facilitates sharing of chemicals between researchers. For more information about the SCS Chemical Inventory Program or how to use the Chemical Safety EMS inventory, please refer to the Chemical Inventory webpage on the SCS website.

Chemical Borrowing Policies

When borrowing chemicals from another research group, the following policies must be adhered to:

- ALWAYS ask for permission from a member of the research group that owns the chemical. If they aren't able to grant permission for the specific chemical, they will be able to direct you to the person who can. NEVER go into a lab and just take a chemical.
- It is always at the discretion of the research group that owns the chemical whether to allow the chemical to be borrowed. There are several factors that may lead a researcher to deny access to a chemical such as only having enough for their own research or the chemical being too expensive.
- ALWAYS read the SDS prior to borrowing any chemical that you have not used before.
- Chemical bottles should not be removed from the lab of the group that owns them so make sure to bring a vial with you to measure out the quantity of chemical you need. Make sure to also be aware of any special handling procedures needed to safely transfer the chemical from the bottle to your vial. There may be special cases where the research group allows you to take the bottle back to your own lab but that is at their discretion.
- If your group requires training prior to using the particular chemical or the class of chemicals it belongs to, make sure you receive and document the training from your LSO or member of your group that has experience using it.

8. Chemical Waste

DRS offers a jerrican pick-up program for high-volume generators of solvent and oil waste at RAL and CLSL.

Solvent and oil waste generated in quantities greater than one jerrican per two weeks can be disposed through the weekly jerrican pickup program. Solvents should be separated into halogenated and non-halogenated waste streams. Waste jerricans are available for purchase in the RAL Storeroom.

For more information, refer to the DRS guidance document Roger Adams Lab Jerrican Pickup Program

For all other waste collection information, refer to the DRS Laboratory Safety Guide.

9. Emergency Situations and Equipment

In the event of a fire, accident, injury, or other emergency situation, email SCS Facilities and Safety to notify them about the event in addition to contacting DRS. A log of all fires must be maintained by F&S Safety and Compliance so please make sure to notify us in the event of any fire, even if you are able to extinguish it on your own. An "Incident or Near Miss" form should also be filled out for the Chemistry Joint Safety Team.

Building Emergency Action Plan (BEAP)

The BEAP contains information about how to respond to emergencies such as fire, severe weather, and active threats to the campus. There is a BEAP for each building in SCS so be sure to review the information for each building you typically work in.

Safety Showers and Eyewashes

Safety showers and eyewashes are to be used to rinse off affected areas on your body in the event of an exposure to a hazardous chemical or biological material. Locations of safety showers and eyewashes vary throughout SCS buildings so make sure to identify where the locations are in your lab and your surrounding areas. Safety showers and eyewashes will be tested annually by DRS personnel. In addition, eyewashes must be flushed weekly by lab occupants to ensure proper function and clean water. If the safety showers are activated in the event of emergency, contact Facilities and Services at 333-0340 for water cleanup.

Fire Alarms and Extinguishers

Fire alarms will set off continuous buzzers throughout the building, signal occupants to leave the building, and notify emergency response personnel. Pull stations are located throughout SCS buildings, primarily near exits. They should be activated when building evacuation is necessary in the event of a fire, chemical spill, gas leaks, or other hazard.

Laboratory personnel may attempt to extinguish small fires if:

- 911 has already been called
- Personal safety is not in jeopardy
- Personnel are properly trained concerning fire-fighting equipment and its appropriate use
- Appropriate fire-fighting equipment is available

If the fire grows or becomes unmanageable, activate the nearest fire alarm. Meet the fire department to direct them to the affected area.

Fire extinguishers are provided in every laboratory and must be readily accessible at all times. There are two types of fire extinguishers available in the labs: carbon dioxide and ABC dry powder. The carbon dioxide extinguishers are effective with Class B (flammable liquid) and Class C (electrical) fires. The ABC dry powder extinguisher is effective with Class A (combustible solid) as well as Class B and C fires. The tag attached to each extinguisher will let you know what type of extinguisher it is. If the fire contains reactive metals (Na, K, Mg, etc.) or active hydrides (NaH, KH, etc.), also known as a Class D fire, DO NOT use the ABC or carbon dioxide fire extinguishers. An inert powder such as Metal-X or sand or a Class D fire extinguisher will need to be used to put out this type of fire.

For lithium fires, a Class D Copper Base fire extinguisher, Lith-X powder, or sand is needed. SCS has Class D Copper Base fire extinguishers and Lith-X available for check-out in the following closets in South RAL: 155A, 255A, 355A, 455A. There are also Class D extinguishers available in designated areas in the hallways of the 1st through 4th floors of CLSL-A. Any time you plan to use lithium, check out one of these extinguishers by filling out your information on the sheet inside the closet door or on the wall above the extinguisher. Keep the extinguisher by your work area and promptly return it to the closet when you are done using lithium for the day.

Spill Kits

It is required that each research group maintain their own spill kit. Each kit should contain necessary materials to address spills for any hazard type present in your labs. There are spill kits available in the hallways that contain gloves, goggles, and spill pads for simple spills. If you use any of the materials from the hallway spill kits, contact SCS Safety personnel so we can replace any necessary items. For more information about preparing a spill kit, please visit the Emergency Preparedness webpage on the DRS website.

Emergency Doors/Panels

Some South RAL and CLSL-A laboratories feature emergency doors or break-a-way panels between interconnecting labs. These doors/panels are marked "EMERGENCY" and are usually kept closed to avoid the spread of fire, provide privacy, and maintain security. They are weakly secured so that a hard impact will cause the mechanism to break allowing passage. Emergency doors/panels should never be blocked since they may be the only available exit during an emergency.

Bodily Fluid Cleanup

Care should be taken when dealing with blood and bodily fluids. Blood borne pathogens (e.g., HIV and Hepatitis) can live in a pool of blood for weeks. The best person to clean up the blood is the person who bled. If that person is unavailable to do so, secure the area and contact SCS Safety personnel for cleanup assistance.

First Aid

First aid training can be made available upon request but providing first aid is NOT a condition of employment due to the associated risks. If you would like to receive first aid training, contact SCS Safety personnel for information about upcoming classes.

Helpful Links

SCS Safety Website

Division of Research Safety

Chemistry Joint Safety Team

Reviewed September 2026