Servicing and Decommisioning of Laboratory Equipment, Appliances, and Systems

Policy

This Standard Operating Procedure (SOP) is a tool that can be used to by University Facilities & Services (F&S) personnel and building occupants to document hazards and safe work practices when maintenance, repair, renovation or construction activities involve contact with contaminated surfaces of laboratory equipment. Alternative processes may be developed and utilized to streamline the communication process (e.g., written standard operating procedures for preventative maintenance work on equipment with repetitive, known usage).

Scope

This SOP applies to maintenance, repair, renovation or construction activities where F&S service personnel may be exposed to hazardous materials from laboratory operations or where laboratory personnel may be exposed to hazardous environments due to service work that temporarily shuts down laboratory safety devices. The SOP lists the guidelines for the identification of hazardous materials and communication of safe work practices associated with equipment, appliances, and systems including, but not limited to:

- Laboratory exhaust equipment, systems, and services within the exhaust streams of chemical fume hoods, biological safety cabinets, laminar flow hoods, vacuum systems, and other local exhaust systems;
- Plumbing systems including lab sinks, fume hood sinks, and neutralization basics/tanks;
- Appliances including refrigerators, freezers, ovens, furnaces, climate controlled rooms, and growth chambers; and
- Other storage cabinets, lockers, and bins used to store hazardous materials.

The Hazard Assessment Checklist included in Attachment 1 serves as a means of communicating scope and schedule from F&S to the requesting unit, and hazards and protective measures to F&S Shops personnel. The Hazard Assessment Checklist should be used when specific hazardous contents are not known to F&S for services performed on:

- Ventilation equipment, excluding house vacuum pumps, used in research or during active use in teaching labs;
- Laboratory devices that require disposal, such as refrigerators, freezers, and ovens;
- Sinks and drains in labs that may have had hazardous materials poured down them;
- Dedicated vacuum systems lacking proper traps or filters; and
- Neutralizing sumps and tanks.

The Notice sign included in Attachment 2 serves as communication to laboratory personnel to cease use of equipment that has been signed and to F&S personnel that equipment is ready for service work/disposal. The Notice sign should be used when services performed by F&S include:

- Ventilation equipment, excluding house vacuum pumps, used in research or during active use in teaching labs;
- Laboratory devices that require disposal, such as refrigerators, freezers, and ovens; and
- Other equipment requiring decontamination prior to service or maintenance work (e.g., cold storage with elevated radiation levels or an unmitigated chemical spill).

Specific procedures have been developed and are included in this SOP for service of:

- Teaching lab exhaust systems;
- Laboratory vacuum systems;
- Air streams of ganged laboratory exhaust systems;
- Neutralizing sumps and tanks;
- Sinks and drains; and
- Walk-in refrigeration units and temperature controlled rooms; and
- Equipment decommissioning.

Coordination and Cooperation

F&S Shops, Unit Contacts, DRS, and OSH will engage in active and proactive communications to promote safe work environments, effective completion of work, and efficient processes. Ideas on process improvements, standing processes for specific equipment/appliances/systems are encouraged. Feedback on this SOP is always welcomed by emailing oshs@illinois.edu.

Contractors:

In accordance with the OSHA Hazard Communication Standard, the University has an obligation to communicate hazards to contractors prior to work starting. Contractors are responsible for providing safety to their own employees including reviewing hazard information, requesting removal or relocation of laboratory equipment and materials, and recommending and providing PPE to their employees. The Hazardous Assessment Checklist located in Attachment 1 can be used to obtain hazard information but it is the responsibility of the contractor to review and make recommendations to their employees for safe work practices.

Waste

Special disposal of equipment, appliances, and system components is generally not required unless special conditions indicate potential hazardous waste sources. Asbestos-containing materials must be handled and disposed of by the F&S Labor Shop. Equipment and appliances containing refrigerant must be disposed by the F&S Refrigeration Shop. Contact the DRS Regulated Waste Section at at 333-2755 or cws@illinois.edufor other questions regarding disposal.

General Safety Procedures

Laboratory equipment and appliances can potentially be contaminated with biological material, chemicals and/or radioisotopes. Accessible equipment surfaces that F&S service personnel will directly contact must be cleaned and/or decontaminated prior to servicing, maintaining, relocating, or decommissioning. The following precautions shall be recognized by F&S service personnel at all times during service work:

- Check-in with the building single point of contact (SPOC) at the beginning and end of work;
- Obtain permission to shut down the equipment and/or associated system when service requires the system to be shut down. Note that an outage request may be required depending on the on equipment/systems to be shut down. In addition, communicate to the Unit Contact the time and duration of the shut-down.
- Implement other safety procedures, as necessary, to safely perform work (e.g., LOTO, respiratory protection).

- Prior to starting work identify means of egress and location of emergency shower/eyewash;
- Always assume surfaces have residual contamination even after cleaning. Trace amounts of contamination or compounds used during the cleaning process can cause symptoms such as contact dermatitis;
- Always wash hands and face prior to eating, drinking, smoking, applying cosmetics, and handling contact lenses;
- Do not alter, open, move, or remove laboratory chemicals and/or equipment to access your work area. Notify the Unit Contact or room occupants if laboratory chemicals and/or equipment need to be altered, moved, or removed to work safely;
- Do not attempt to cleanup spills or residues on accessible surfaces. Contact the nearest lab worker for assistance;
- If there is a spill, contact the nearest lab worker and leave the area until lab personnel tell you it is safe to re-enter;
- Always wear PPE identified on the Hazard Assessment Checklist (Attachment 1), SOP, job hazard assessment (JHA), or other communication indicating proper PPE;
- Observe signage and labeling on the laboratory door, equipment/appliances, and containers and restrict your activities to your work area; and
- Assume unmarked containers are holding hazardous materials and ask for assistance from lab personnel if they need to secured or moved.
- Stop work and ask for assistance (laboratory personnel, OSH, DRS, , etc.) if unmitigated hazards are suspected.

Special Hazards

Some hazardous materials require special assessment and/or decontamination procedures. Depending on the hazard a consultant may have to be retained to assist with hazard assessment and mitigation strategies and a specialty contractor hired to complete the work. Materials that may pose a special hazard include:

Explosive materials – Additional information on explosive materials can be found at https://www.drs.illinois.edu/Programs/SafetyManagement#.

- Perchloric acid – perchloric acid that is heated or is exists in solution at greater than 70% can form explosive crystals within exhaust equipment and systems that are sensitive to friction, shock, and heat. OSH can perform limited testing for perchlorates when F&S Shops will be performing work.
- Picric acid – Picric acid for explosive crystals when it dries. I alsoforms shock sensitive explosives on contact with metals, therefore a container with a metal lid may pose a greater explosive hazard if the container is old.
- Sodium azide – Sodium azide forms shock-sensitive explosives on contact with metal.
- Ethers and other peroxide forming solvents. Most peroxide forming solvents form shock-sensitive explosive peroxide compounds on exposure to atmospheric oxygen; a process accelerated by exposure to light or heat. Organic peroxides are among the most hazardous substances handled in the laboratory due to their instability and shock-sensitive nature.

- Other potentially explosive solid compounds include, but are not limited to, benzoyl peroxide (dry), 2,4-dinitrophenol, 2,4-dinitrophenyl hydrazine, hexanitrodiphenylamine (dipicrylamine), 1-methyl-3-nitro-1-nitrosoguanidine, nitrogen trichloride, nitrocellulose, pyroxylin, picramide, picryl chloride (trinitrochlorobenzene), picrylsulfonic acid (trinitrobenzenesulfonic acid), trinitrobenzene, sodium amide, potassium metal (old), cyclotetramethylene-tetranitramine (HMX), cyclotrimethylenetrinitramine (RDX).
- Other potentially explosive organic solvents include, but are not limited to, acetaldehyde, diazald, dioxane, furan, N-methyl-N-nitroso-p-toluenesulfonamide, tetrahydrofuran (THF).

Radioisotopes – Equipment and appliances labeled as radiation hazards that have to be contacted by F&S personnel during service work must undergo a contamination survey performed by the DRS Radiation Safety Section prior to beginning work. Additional decontamination may be required pending results of the survey.

Category 1 acute toxicity hazardous chemicals for dermal, inhalation, skin corrosion, eye damage, and target organs – Hazard categories can be found on the chemical-specific safety data sheet (SDS).

Biological Materials -
The use of the International Biohazard Symbol will alert personnel to the presence of biohazards. A biohazard is something that is dangerous to life; this may be a human health hazard or an environmental hazard. When you see the biohazard symbol, it is important to identify the hazard present. The biohazard symbol should be posted on the laboratory door sign and all items used to process, store, or discarded biohazardous materials, such as autoclave bags/trashcans, biohazard containers, incubators, or other equipment. Any equipment, tools, or samples should be removed from the immediate work area before work begins. If the equipment is used to process biological materials or samples it should be decontaminated prior to the start of work.

Asbestos-containing materials – asbestos-containing materials may be used as components of equipment, appliances, or systems such as transite panels and ducst, galbestos duct lining, asbestos-containing seals and gaskets. These materials must not be disturbed until the material has been verified as asbestos or non-asbestos. Contact the Labor Shop to test or remove suspect asbestos materials.

General Process for Work on Laboratory Equipment, Appliances, and Systems
Unless a specific process is presented below, the general process for working on laboratory equipment, appliances, and systems are anticipated to use the following process. If the actual conditions are not conducive to utilizing the general process and there is no specific process, utilize appropriate steps of the general process that will result in completing the work in a safe, effective, and efficient manner.

- Unit Contact submits a work order for repair, maintenance, relocation, or decommissioning of laboratory equipment, appliance, or system. OR A Preventative Maintenance work order is released maintenance of laboratory equipment or system.
- The F&S ShopRepresentative completes the Project Information section of the Hazard Assessment Checklist in Attachment 1 and sends to the Unit Contact with request for information.

- Unit Contact completes the Hazard Information and Equipment and Appliance Decontamination section of the Hazard Assessment Checklist.
- The Unit Contact conducts the securing of hazardous materials, relocation of any items necessary for safe access to work area, and decontamination of the equipment or appliance in accordance with the DRS Process for Decontaminating Laboratory Equipment.
- The Unit Contact posts the Notice sign in a conspicuous space on the equipment or lab door.
- The Unit Contact returns the form to the F&S Shop and OSH via email at oshs@illinois.edu.
- OSH reviews the Hazard Assessment Checklist and completes the Safe Work Practices for F&S Employees section and returns the form to the F&S Shop Representative.
- The F&S Shop Representative reviews the Hazard Assessment Checklist and completes the Confirmation of Hazards and Recommendations section and ensures that employees performing work have the training and PPE necessary to safely complete the work.
- The F&S Shop Representativereviews the hazards and safe work practices with the employee(s) assigned to the work.
- The F&S employee(s) performs work in accordance with the safe work practices identified in the Hazard Assessment Checklist, asks questions if actual conditions are not consistent with those identified in the Hazard Assessment Checklist, and removes the Notice sign upon completion of work.

Teaching Lab Exhaust Systems

Operations in teaching lab exhaust systems generally remain consistent from year to year to meet curriculum requirements. In lieu of completing the Hazard Assessment Checklist (Attachment 1) and posting the Notice sign (Attachment 2) the following steps can be taken for work during breaks (e.g., spring break):

- The Unit Contact submits to OSH a list of experiments being conducted including hazardous materials used (Note: It is advised that the list is provided as far in advance as possible to avoid delays in completing work);
- OSH reviews the list of experiments and works with the F&S Shop to identity PPE requirements and safe work practices using a JHA;
- The F&S Shop Representative will email the Unit Contact the date/time of the service work and request verification that there has been no change in experiments and hazardous materials used;
- The Unit Contact will secure hazardous materials, relocate hazardous materials and equipment that pose access issues, and decontaminate surfaces that may be contacted by F&S employees using an appropriate cleaning agent in accordance with the DRS Process for Decontaminating Laboratory Equipment. (Note: Additional communication and in-person walkthroughs by the Unit Contact and F&S Shop personnel may be necessary to properly identify areas that need accessed.)
- The Unit Contact will reply to the F&S Shop Representative email indicating that surfaces have been cleaned and a contact number should issues arise during the course of the service work.
- &S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the JHA.

If work is to occur during class periods, a Notice sign shall be placed on affected equipment and/or the lab door(s) to prevent use following decontamination.

Laboratory Vacuum Systems

Vacuum systems are used frequently in laboratory research and associated with several types of laboratory equipment and processes (e.g., solvent degassing, filtration, desiccators, gel dryers). Traps should exist on vacuum systems to prevent chemical vapors from reaching the vacuum pump. CDC/NIH Guidelines require vacuum systems used at Biosafety Level 2 (BSL2) and above to be protected from potential contamination by the use of high efficiency particulate air (HEPA) filters. These guidelines state: Vacuum lines are protected with High Efficiency Particulate Air (HEPA) filters.

Most volatile contaminants that enter the vacuum system pass through and are exhausted. However, some chemical residues may contaminate parts of the vacuum system. There are three potential sites where contamination may occur:

- The sealing liquid in liquid sealed pumps (except dry pumps);
- The solid internal surfaces within the pump and/or piping system; or
- The water in the air-receiving tanks (in larger systems).

House vacuum pumps – The following steps shall be taken for work on house vacuum pumps:

- F&S Shop Representative shall submit an outage request.
- Once the outage request has been approved, F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the JHA for work on house vacuums.

Local vacuum pumps – The following steps shall be taken for work on local vacuum pumps:

- The Hazard Assessment Checklist (Attachment 1) shall be completed and reviewed as described in the General Process for Work on Laboratory Equipment, Appliances, and Systems;
- The Unit Contact shall disconnect the pump from any experiments and decontaminate the exterior of the pump if it is located in the lab.
- The Unit Contact or F&S Shop personnel shall place a Notice sign on the vacuum pump if it is to be serviced in the lab. The sign shall remain on the vacuum pump throughout the duration of the work if it takes place in the lab.
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist.

Clogged vacuum lines – The following steps shall be taken for work on local vacuum pumps:

- Complete a Hazard Assessment Check list, confirm laboratory personnel decontamination (work area, equipment, appliances, etc.), and the applicable signage has been posted.
    - Notify lab personnel before continuing work, if additional decontamination is required due to the blockage being located down line from initial work area.
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist.
    - The use of power tools (such as grinders) should be avoided when possible. If the use of power tools is probable or unavoidable to remove a section of blocked line notify S&C

because additional PPE (such as a respirator) may be required based on the Hazard Assessment Check list.

Air Streams of Ganged Laboratory Exhaust Systems

The following steps shall be taken for work in the air stream of ganged laboratory exhaust systems:

- F&S Shop Representative shall submit an outage request.
- Once the outage request has been approved the Unit Contact shall:
  - secure hazardous materials in associated exhaust equipment; and
  - post Notice signs on exhaust equipment and/or laboratory doors prior to the beginning of the outage;
- At the request of the F&S Shop Representative, the Unit Contact will verify conditions with F&S personnel immediately prior to beginning work.
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the JHA for work in the exhaust air stream.

Neutralizing Sumps and Tanks

Maintenance and inspection of neutralizing sumps (limestone chip tanks) shall only be performed by licensed plumbers. Plumbers shall wear required PPE to prevent exposure to identified hazards in accordance with the JHA for the work to be performed. Contact OSH at 265-9828 with any questions.

The following steps shall be taken for work on neutralizing sumps/tanks serving multiple laboratories:

- F&S Shop Representative shall submit an outage request.
- At the request of the F&S Shop, the Unit Contact will verify conditions (ie, potential causes, list known chemical hazards) with F&S personnel prior to beginning work.
- F&S personnel shall don appropriate PPE and take additional safety precautions in accordance with the JHA for work in the exhaust air stream.

Local neutralizing sump/tank - The following steps shall be taken for work on local neutralizing sumps/tanks:

- The Hazard Assessment Checklist (Attachment 1) shall be completed and reviewed as described in the General Process for Work on Laboratory Equipment, Appliances, and Systems;
- The Unit Contact or F&S Shop personnel shall place a Notice sign on the sink(s) that drain into the sump/tank. The sign shall remain on the sink(s) throughout the duration of the work.
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist, and remove the Notice sign.
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist, and remove the Notice sign.

Sinks and/or Drains

The following steps shall be taken for work on sinks and drains:

- The Hazard Assessment Checklist (Attachment 1) shall be completed and reviewed as described in the General Process for work on Laboratory Equipment, Appliances, and Systems;

- Decontaminate surfaces in and around the sink, if feasible;
- If the sink is located inside other laboratory equipment, such as a fume hood, the Unit Contact shall conduct or assign the following:
    - remove items from the interior locations that require access;
    - decontaminate surfaces that may be contacted during service work; and
    - post the Notice sign on the equipment to prevent use following decontamination; and
    - notify the F&S Shop that the equipment has been cleaned and signed;
    - complete and post "NOTICE" signage
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist, and remove the Notice sign.

If mercury is encountered in the sink trap during work, put the trap in a container to prevent spillage and contact the F&S Labor Shop to perform any mercury spill cleanup and disposal.

Walk-in Refrigeration Unit and Temperature Controlled Rooms

If mercury spills are discovered during the servicing, replacement, or demolition work should stop immediately and the labor shop should be contacted for clean-up.

Equipment/Appliance Decommissioning

The following steps shall be taken for equipment decommissioning:

- The Hazard Assessment Checklist (Attachment 1) shall be completed and reviewed as described in the General Process for Work on Laboratory Equipment, Appliances, and Systems;
- The Unit Contact shall:
    - remove all items from the interior and anything sitting on the exterior of the equipment/appliance;
    - decontaminate all accessible surfaces in accordance with the DRS Process for Decontaminating Laboratory Equipment;
    - post the Notice sign on the equipment to prevent use following decontamination; and
    - notify the F&S Shop that the equipment/appliance is ready to be decommissioned;
- F&S employees performing work shall don appropriate PPE and take additional safety precautions in accordance with the recommendations on the Hazard Assessment Checklist.

Project Information (To Be Completed by F&S Shop)			
Building #:	Building Name:		Room #:
Projected Start Date:	Duration:	F&S Contact:	
Email:	Phone:	Pager:	
Description of Maintenance:			
Date Submitted to Unit:	Date Return Receipt Requested:		

Research Information (To Be Completed by Unit Contact)		
Unit Contact:	Email:	Phone:
Current PI:	Email:	Phone:
Current Use of System:		
Previous PI:	Email:	Phone:
Previous Use of System:		
Date Completed:		
Note: A list of Unit responsibilities is included at the end of this document.		

Hazard Information (To Be Completed by Unit Contact)		
1. What type of Laboratory Equipment or Appliance is being affected by this maintenance?		
Exhaust Equipment	Plumbing Systems	Appliances
☐ Chemical Fume Hood	☐ Lab Sink / Drain	☐ Refrigerator/Freezer
☐ Biological Safety Cabinets	☐ Fume Hood Sinks / Drain	☐ Oven
☐ Laminar Flow hood	☐ Neutralizing Sump / Drain	☐ Furnace
☐ Vacuum system		☐ Climate Controlled Rooms
Other:		
Make:	Model:	Serial Number:

2. Are (were) any infectious or potentially infectious organisms used or stored in this system?	☐ Yes ☐ No
3. Are (were) hazardous chemicals used or stored in this system?	☐ Yes ☐ No
4. Are (were) radioactive materials used or stored in this system?	☐ Yes ☐ No
If yes to 2, 3, or 4, Please List Potential Contaminates and refer to the Responsibility of Requesting Unit (#3-5):	
5. Was/Is perchloric acid being used in this system?	☐ Yes ☐ No
If yes, Was/Is it being heated above ambient temperatures?	☐ Yes ☐ No ☐ N/A

Tested for Perchlorates?	☐ Yes ☐ No	Test Results:

6. Are experiments currently taking place or are chemicals being stored in affected equipment or appliances? If yes, secure hazardous materials, relocate hazardous materials and equipment that pose access issues, and decontaminate surfaces that may be contacted by F&S employees.	☐ Yes ☐ No

Equipment and Appliance Decontamination Procedure (To Be Completed by Unit Contact)

7. Select potential contaminate and briefly describe the decontamination process. DRS provides general procedures for decontamination here and can be contacted for further assistance.

Radioactive: ☐ Chemical: ☐ Biological: ☐ Perchlorates: ☐ Other:_____

Method:

Reviewed By:	Date:

Safe Work Practices for F&S Employees (To completed by OSH)

Recommended PPE and other Precautions:

Reviewed By:	Date:

Confirmation of Hazards and Recommendations (To Be Completed by F&S Shop Representative)

Shop Representative:	Date:

.

NOTICE

F&S will be servicing this piece of laboratory equipment on:

Start Date: _____ End Date: _____

Building: _____ Room: _____

Time: _____ Date Posted: _____

Make: _____ Model: _____ Serial #: _____

DO NOT USE this piece of laboratory equipment!

If you need to speak to the F&S personnel servicing your hood please call:

Name: _____ Phone: _____

Before maintenance work can begin the Unit Coordinator or their designee must attest to the below statement.

I have verified that all chemicals and other hazardous materials have been removed from the laboratory equipment or appliances and the interior surfaces have been decontaminated in accordance with the procedure described on the Hazard Assessment Checklist.

Name: _____ Signature: _____

Date: _____ Phone: _____

In an emergency contact the at 911.