

Molecular Engineering Materials Center
User Facility Policies
MEM-C
University of Washington
July, 2020

This document is a reference manual covering the basic operational policies for use of the Molecular Engineering and Materials Center User Facility (MEM-C) at the University of Washington. The MEM-C Facility houses state-of-the-art instrumentation serving multiple clients and providing qualified users with 24/7 access.

All MEM-C users must understand and adhere to the following policies before using laboratory equipment.

It is impossible, however, to define a policy for every conceivable situation. Rules and policies are no substitute for common sense. Anyone who fails to act in a professional, safe, and responsible manner while in the MEM-C Facility will be banned from further use of the facility.

Users' suggestions and feedback on MEM-C Facility operations and equipment are welcome at all times. Please feel free to direct your suggestions to the laboratory manager.

Acknowledging use of facilities

All publications that result from the use of the MEM-C Facilities are required to properly acknowledge the MEM-C. The appropriate acknowledgment is:

"The authors acknowledge the use of facilities and instrumentation supported by the U.S. National Science Foundation through the UW Molecular Engineering Materials Center (MEM-C), a Materials Research Science and Engineering Center (DMR-171797)."

1. General Procedures

1.1 Categories of Users

- Professional Staff - Full or part time MEM-C employees
- UW Academic Users - University of Washington faculty, staff, postdoctoral fellows, and graduate and advanced undergraduate students working on an approved research project at MEM-C Facility
- Other Academic Users - Faculty, staff, postdoctoral fellows, and graduate and advanced undergraduate students from other universities or colleges or state and federal laboratories conducting an approved research project at the MEM-C Facility

- Industrial Users - Engineers and/or scientists from non-academic facilities working in the laboratory on an hourly basis

All of the above users fall into one of two access categories:

- Regular-hours Users - Users working during regular business hours Monday to Friday when MEM-C staff is available for assistance
- Off-hours Users - Users qualified to work in the MEM-C Facility at times other than regular business hours Monday to Friday (additional training and evaluation are required for users to earn off-hours status)

1.2 Access

The MEM-C Facility is only available to users affiliated with and working on research projects that have been approved by the MEM-C manager. Based on successful completion of training in the use of MEM-C equipment, staff will request access for the user's Husky card (or "temp card" to be issued to an external user) from the MoES/NanoES building manager to allow entry to the MEM-C areas on the ground floor of the NanoES building. The activated card provides the individual authorization to enter the facility. Sharing of cards or allowing unauthorized access to the facility is not allowed. Loaning of cards to others is a serious violation. Non-authorized persons are prohibited from accompanying, observing, or helping users at work, unless specifically approved by the laboratory manager. MEM-C qualifications are revoked for users who are inactive for six months.

1.3 Hours of Operation

Normal business hours are 8 a.m. to 6:00 p.m., Monday through Friday. All regular-hours users must schedule their work during these business hours and reserve the needed equipment online. Undergraduate users must perform their work during business hours and are not eligible for off-hours access. The laboratory is open to qualified off-hours users 24 hours a day, seven days a week. Users must undergo off-hours training with the MEM-C staff person responsible for the desired instruments to qualify for 24 hour access. More information on rates and hours is provided in section 2.3.

1.4 Facility Governance and Appeals

The laboratory manager is responsible for the continued operation of the facility. Use of the facility is at the sole discretion of the management. The laboratory manager, staff, and superusers are responsible for maintaining and enhancing the equipment and other resources of the facility, and for ensuring that operational policies are followed. Authority and responsibility for safe operation of the laboratory flows from the director to the laboratory manager to the staff. On matters involving equipment usage or safety, all users must follow direct instructions from the staff and superusers. Both staff and users are expected to act in a courteous and professional manner at all times. Deviations from this norm by either users or staff should be immediately reported to the laboratory manager. If at any time a user feels unfairly treated by a staff member or strongly

disagrees with the rules imposed by a staff member, they should discuss the situation with the laboratory manager. The sequence of appeals is from the laboratory manager to the director.

1.5 Responsibility for Equipment Damage

Much of the equipment is delicate and expensive to repair. Staff and superusers have developed protocols for the safe operation of the tools to prevent damage. If a user deviates from the protocols and training provided and damages the instrument, their PI or organization may be held liable for the cost of repairs. Please remember that the first priority is always to operate the equipment safely according to existing protocols.

A simple mistake made out of inattention or ignorance can result in tens of thousands of dollars in damages. If there are lingering questions about any aspect of the protocols, it is the user's responsibility to get assistance. Never guess at the correct way to proceed and ask staff members or superusers any questions you have about instrument operation

2. Equipment Use and Availability

2.1 Registration

New users should register online at:

<https://www.coral.washington.edu/tomcat/CORAL/MEMC.html?mode=register>

to indicate interest in using the MEM-C Facility. Provide all of the information requested on the three-step registration form. The laboratory manager will assess the proposed research project(s) for availability of tools and processes, as well as for project feasibility and safety, and will arrange for any required training. Upon completion of these steps, the laboratory manager or MEM-C professional staff and superusers can authorize users of the MEM-C Facility for instrument access.

Much of the equipment in the facility is delicate and direct hands-on access is restricted. While hands-on access is an important part of the educational process, rules and procedures for the use of instruments are in place to assure their continued smooth operation. Violation of these procedures or carelessness in operation can result in damage to the equipment, downtime, and considerable expense. Carelessness or damages caused by improper operation while using any of equipment may result in suspension of user privileges for either a specific instrument or the facility as a whole.

2.2 Equipment Scheduling

Users can reserve available time on instruments through the UW CORAL website - <https://www.coral.washington.edu/>. Failure to cancel an unneeded reservation results in inefficient utilization of resources, and the full reservation will be charged to the user. Users are strongly encouraged not to over-book popular equipment and make every effort to utilize at least 75% of the equipment time reserved. If billing records show regular or habitual under-utilization of your reservations, you will be billed for the full equipment time reserved.

Users who need assistance from a staff member have priority for system access during the normal working day (Monday – Friday, 8:00 a. m. to 6:00 p.m.). This priority does not extend into evenings or weekends. This, however, is not an excuse for indiscriminate bumping of scheduled users except in an extreme emergency situation.

Users are encouraged to schedule time with a staff member one week in advance if staff assistance is needed in the use of any instrument. It is the responsibility of users to initiate such scheduling. All scheduled users need to coordinate with the laboratory manager to avoid conflict with resources. If a user needs priority access to the tools, s/he can ask the laboratory manager, who reserves the right to change the schedule for the use of the lab and instruments as needed.

2.3 Equipment Charges

Equipment charges help pay for expendables and maintenance costs and are calculated on an hourly basis. Industrial and academic users are charged at different rates. External academic user fees are larger than the internal UW rate. Industrial rates are chosen to be comparable to those charged by commercial suppliers of equivalent services where applicable. Users will be billed at the end of each month for accumulated user charges. For UW users, this will be done via budget number. External users should supply a purchase order number against which charges can be billed. Failure to pay usage charges will result in cancellation of MEM-C use privileges. Users may discuss charges with the laboratory manager, if they have any questions.

For UW users only: whenever your budget number changes, please update the budget numbers in your Coral account so that MEM-C staff can maintain current, accurate account numbers at all times and avoid unnecessary book-keeping costs.

2.4 Problems

Problems with equipment, malfunctions, breakdowns, etc., should be immediately reported to the laboratory staff/superusers. Users should not try to fix or adjust anything. NTUF equipment is expensive and much of it is very delicate. Considerable damage can be done at a great cost of both money and downtime by well-meaning attempts to fix malfunctions. There is no reason for any user to use a tool on anything, with the exception of a small screwdriver or Allen wrench for sample mounting. If users damage equipment by not consulting staff members or by disregarding the suggestions provided by the staff members, these users will be held responsible and may be charged for any needed repairs, in addition to facing possible suspension of access.

Any emergency involving injuries, fire, chemical spills, etc., should be reported to UW Environmental Health and Safety (EH&S).

3. Laboratory Practice

3.1 Visitors

Users are discouraged from bringing visitors for tours in the facility. A “visitor” is defined as anyone without an assigned key. The laboratory manager can schedule tours in advance for any visitor. Users should not bring visitors during training, qualifying, or warm-up sessions without special permission.

3.2. Storage

The laboratory manager will assign a limited amount of storage space to facility users. Storage space should be used for keeping samples. No chemicals of any kind may be stored in sample storage drawers. Chemicals approved by MEM-C staff are only to be stored in designated, ventilated chemical cabinets. Do not put any material in a drawer that is not assigned to you. Be sure to label all stored items with your name and date. MEM-C staff may dispose of items left in unassigned spaces, as well as items labeled as belonging to non-active graduate students and research groups. See the laboratory manager for space allocations. No additional dry boxes, desiccators, cabinets, etc., may be left in the laboratory without permission.

4. Hazards

The MEM-C Facility is a laboratory space controlled by the University of Washington. As such, we must follow rules outlined in the University of Washington Laboratory Safety Manual put together by Environmental Health and Safety (EH&S). This manual can be found at: <http://www.ehs.washington.edu/manuals/lsm/lsm.pdf>

You are responsible for understanding this laboratory safety manual and abiding by its rules. Additionally, there are several EH&S online safety courses you must complete to become a lab user.

4.1 Understanding Hazards

Do not use or handle any chemical until you read and understand its label and safety datasheet (SDS). Understand the hazards, handling, storage, disposal, and emergency procedures for every chemical you use. SDSs are located on all facility computers. You also need to know evacuation routes and locations of eyewashes, and shower stations.

4.2 General Safe Practices

- Do not taste, touch, or smell any chemicals.
- Do not mix, heat, dispose, or otherwise use chemicals in an unauthorized manner.
- Work with chemicals in an exhausted fume hood or wet bench.
- Use chemicals only in wet benches where they are approved.
- Never mix acids and solvents.
- Never dispose of solvents down water drains.

- Change your gloves if they might be contaminated.
- Label your chemicals.
- Do not place or store chemicals above the level of the wet bench surface.
- Never remove chemicals from the lab without permission.
- Use chemicals and wipes sparingly.
- Do not interrupt users working with chemicals.
- If you are unsure of handling or safety procedures, ask questions.

4.3 Chemical Classes and Storage

Acids – Acids are substances that donate protons when dissolved in water. Acids are used for etching metal and cleaning wafers, are generally corrosive, and can be toxic or water reactive (e.g. sulfuric acid). Acids are stored in the appropriate corrosives cabinet.

Bases – Bases accept protons, and can increase the hydroxide ion concentration when dissolved in water. Bases are stored in the appropriate blue corrosives cabinet.

Oxidizers – Oxidizers are agents that are easily reduced, and generally supply oxygen to chemical reactions. Oxidizers can react violently with organic chemicals. Oxidizers are stored in the appropriate corrosives cabinet.

Solvents – Although the term “solvent” refers to any liquid used to dissolve another material, in the MEM-C Facility, “solvents” are typically organic liquids that are flammable or combustible. We use acetone, isopropyl alcohol, methanol, dichloromethane, chloroform, and a variety of others. Solvents are stored in the yellow flammables cabinets.

4.4 New Materials Requests

Before bringing a new chemical into the facility, you must send an SDS, and a Standard Operating Procedure to MEM-C staff. The lab manager and the lab safety manager will review the documents prior to approval. **NO UNAPPROVED CHEMICALS ARE ALLOWED IN MEM-C FACILITY LABS.** We do not permit long-term storage of any personal chemicals in the facility without explicit permission.

4.5 Personal Protective Equipment

You are required to use proper personal protective equipment (PPE) when working in the facility. Room G65 requires gloves and eye protection. A lab coat is required when using chemicals. Room G61 requires gloves, eye protection, and a lab coat at all times. If you have any questions about wearing or using PPE please ask staff members or the lab manager.

4.6 Labeling

Prior to filling, all chemical containers must be properly labeled even if you do not intend to walk away. You must include your name, the chemical name, and the date. If you plan to leave chemicals out after leaving the room, a phone number or email and an expected time of disposal

must also be provided. Water must be labeled. If the chemical is not regularly used in the laboratory (e.g. it was brought in after approval from the lab staff), list all hazards.

4.7 Pouring Chemicals

Assume that all chemical bottles are contaminated. Use a bottle carrier when transferring chemicals to and from storage locations. Immediately before pouring, always recheck the chemical label and make sure the chemical container you intend to use is set flat on the bench surface. Do not try to pour small volumes from gallon jugs; instead, transfer chemicals from gallon jugs to graduated cylinders or beakers, and then pour again from this secondary container. Use good judgment and do not overfill containers (i.e. do not fill them so close to the top that moving the container or disposing the chemical is unsafe). Never return poured chemicals to their original container.

Use containers that are compatible with your chemicals. For example, some chemicals or solutions, such as piranha (a mixture of sulfuric acid and hydrogen peroxide), cannot be stored in closed containers even for brief periods of time because it outgases and could cause an explosion. Also, hydrofluoric acid cannot be used with glassware because it will dissolve the container.

4.8 Chemical Bottle Clean-Up

Use chemicals in partially used bottles before opening new bottles. Properly clean empty chemical bottles before disposal. Leave empty solvent bottles open in a fume hood to evaporate. After the solvent residue has evaporated, fill the bottle half full with DI water and dump down a water drain. Repeat this process three times. Acid and base bottles must also be rinsed by filling the bottle half full with DI water, emptying the bottle into a water drain, and repeating at least three times.

4.9 Disposing Solvents

To dispose of used solvent, empty it into an appropriate waste container. Clean the chemical container with an acetone. Remove the label with acetone or IPA (do not bring a solvent squirt bottle into a plastic bench), rinse with DI water and return the container to the drying rack.

4.10 Disposing Acids and Bases

To dispose of used acids and bases, empty them into an appropriate waste container. Small volumes of acids may be neutralized using appropriate means (e.g. sodium bicarbonate) and poured down the drain. Rinse the container three times with water, then rinse with DI water.

4.11 Handling Small Spills

Attempt only to clean small spills for which your training and experience are appropriate, provided you can do so safely without taking unnecessary risks. Large spills or spills outside of wet benches should be treated as emergencies. Refer to the Chemical Emergencies section of this manual.

Clean small solvent spills with lint-free wipes and dispose them in the laboratory waste can. Then use acetone and IPA with wipes to clean the surface(s). Clean acid or base spills by thoroughly rinsing the surface with DI water. Do not wipe up chemicals directly with wipes without first rinsing and diluting the spill thoroughly. Once you are sure that there is only water left on the surface, dry the remaining drops of water with a wipe to leave a clean, dry surface.

4.12 Leaving Workspaces

After using a bench or other workspace, clean up all chemicals, chemical containers, wipes, and other materials (samples, tape, markers, notes, personal effects, etc.). Always leave wet bench surfaces clean and dry within comfortable arms reach, and as organized as possible.

5. Chemical Emergencies

Spill Response – In order to become an onsite user, you are required to complete the UW EH&S Managing Laboratory Chemicals online training course. This training outlines chemical handling and emergency procedures. If you cause or encounter a chemical spill, respond accordingly based on the following scenarios.

- Risk of fire or spills that could spread out of the room: Pull the nearest fire alarm. This alerts the local fire and police departments that there is an emergency at your location and sounds the alarm in the building for everyone to evacuate. Leave the building, helping others as necessary. Then, if possible, call 9-1-1. Tell them what happened. Stay on the scene to help personnel respond to the emergency. Do not fight any fires yourself.

- No risk of fire, spill and vapor contained in the room, but someone is injured or exposed: Call 9-1-1 only. If someone has been exposed to a chemical, begin decontamination and/or first aid as soon as possible. Evacuate the room and wait for emergency personnel to arrive.

- Everyone is safe, but there is a large chemical spill: Contact the lab staff or call the EH&S Spill Advice Line during normal hours at 206-543-0467. Call 9-1-1 after normal business hours and ask for EH&S chemical spill advice. EH&S will advise you on how to clean up your spill or will call the UW's spill cleanup contractor to clean up the spill for you at the lab's expense.

Only attempt to clean small spills for which your training and experience are appropriate. Spill kits are located in each lab space and are labelled on the room maps. Personal protective equipment includes nitrile and neoprene gloves, aprons, and face shields. Do not clean spills that occur outside of the fume hood that may require specialized respiratory protection (e.g. large acid or solvent spills).

Regardless of the size of spill, contact the staff and report the spill details and if/how it was cleaned. Once the spill is handled properly and everyone is okay, the events need to be reported and discussed to improve spill prevention and evaluate the response as a laboratory group. Also, if you are involved in a spill, you must fill out an Online Accident Reporting System (OARS) accident report on the EH&S website. State and federal law requires that all accidents and near-misses be

reported. The University of Washington also has committees that track accidents on campus in order to assess and improve campus safety.

Chemical exposures – Working with chemicals is dangerous. Even common mistakes like dropping a container or leaving a reaction unattended for "just a minute" can have serious consequences when chemicals are involved. Work carefully and deliberately; keep in mind what to do if things go wrong. Read the SDS for all chemicals you plan to use to ensure you are aware of hazards and emergency procedures. Avoid exposures by following the rules below:

- Don't work with chemicals when you're too tired to think clearly.
- Keep your workspaces clean and organized.
- Wear personal protective equipment

If you are exposed to a chemical, do the following:

- Stay calm. Move out of the contaminated area.
- Get the chemical off. Fast dilution is key. If the chemical is on skin or soaking through your clothing, go to the safety shower. Pull the handle on the safety shower, and do not worry about getting the floor wet. Stay in the shower for a minimum of 15 minutes, taking off all clothing necessary to minimize exposure to the chemical. Do not be modest, as your life may depend on removing soiled garments! Get coworkers to help shield you or cover you up. If the chemical is in your eyes, use the eyewash, holding your eyes open in the water for 15 minutes.
- Get a coworker to call 9-1-1 as soon as possible. Have them explain the situation to emergency personnel.
- If possible, obtain an SDS to give to emergency personnel.

You must inform MEM-C staff if you have had an exposure to a dangerous chemical. If a hospital visit is needed, it is always valuable to take the SDS for the chemical to the hospital because the proper medical care can be better determined with the SDS.

6. Fires

In the event of a fire, lab users should activate the nearest pull station and evacuate the building.

- When an alarm sounds, begin immediate evacuation following your floor plan. Close doors behind you.
- If you discover a fire, activate the nearest pull station, close the door and evacuate, and call 9-1-1.
- If the fire alarm does not work, call 9-1-1 and notify occupants verbally of the emergency and the need to evacuate. Evacuation Wardens or another responsible party needs to confirm that all occupants are notified.
- If you are on fire, STOP – DROP – ROLL. If another person is on fire, yell “STOP – DROP – ROLL.”

- Evacuate via the nearest stairwell or grade level exit. Do not block exit doors or wedge them in an open position. The doors must remain closed to keep smoke out and maintain safety for evacuation and fire personnel. Leaving doors open makes the stairwells dangerous and unusable. Persons with physical disabilities have several options (see Appendix D).

- Go to your pre-determined Evacuation Assembly Point (EAP). You may have two or more EAP's depending on the size of the building. Immediately report to an Evacuation Warden so that he or she can accurately track which occupants were able to evacuate. Evacuation Wardens will report to the Evacuation Director.

- If you are trapped by smoke, stay low, cover your mouth with a wet cloth, stay near a window, open it but do not break it, hang something out the window to let fire personnel know you are there and put something in the cracks around the door, phone 9-1-1 if possible.

7. Other Medical Emergencies

There is a First Aid and CPR guide located in all first aid kits. These guides give detailed steps in the event of a heart attack, CPR, choking, bleeding, poisoning, and burns, as well as other injuries. EH&S recommends First Aid/CPR training for a handful of building volunteers to assist with medical emergencies associated with building evacuation and emergencies.

- Stay calm. Assess the situation. Look for a Medic Alert bracelet or necklace on the person requiring help.

- Have someone call 9-1-1. If you are alone, yell as loudly as possible for help. If you are unable to summon help, you have to call 9-1-1 first, and then return and assist the person to the best of your ability.

- When calling 9-1-1, give the operator as much information as possible, i.e. type of emergency, what help is needed, exact address, building name, room number, telephone number, information from Medic bracelet or necklace, and victim information. Don't hang up until you are told to do so by the 9-1-1 operator.

- Do not move the victim.

For additional information visit www.ehs.washington.edu/ohshsplans/firstaidplan.pdf

8. Acknowledgments

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