

# General User Policy Manual



## nanoFAB Policy Manual

As an open access centre, the nanoFAB is committed to promoting the highest standards of competence, practice and safety among all Users and staff. This manual outlines policies, procedures, administration and safety guidelines that must be followed to ensure effective, efficient and safe operations. All Users are expected to review this manual and all procedures and policies outlined must be observed while working within the nanoFAB.

Users should also familiarize themselves with the [Administrative Overview](#).

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# 0.0 Terms of Use

## 0.1 Terms and Conditions for User Access

### Laboratory Policy:

The User agrees to abide by all laboratory policies, as stated in the University of Alberta Nanofabrication & Characterization Centre (“the nanoFAB”) Terms of Use Policy Manual. Although the nanoFAB provides a general safety orientation and training on the safe use of specific equipment, the User assumes responsibility to plan and perform work in such a way as to ensure their own personal safety as well as the safety of others in the nanoFAB community and the integrity of the nanoFAB and its equipment.

### Fees:

The User’s supervisor or representative acknowledges responsibility for purchases, materials costs and lab fees incurred by the User in their use of the nanoFAB.

 A one-time \$200.00 administrative fee is charged for all new registrants.

### Limits on Use:

The User acknowledges that nanoFAB is a community of professional and student researchers. As such, courteous, professional, responsible behaviour is expected at all times. Access to the nanoFAB is a privilege and may be revoked at any time.

## 0.2 Research and Intellectual Property Rights

The User acknowledges that they are ultimately responsible for their own research and that the nanoFAB does not in any way warrant or assure a project success. The nanoFAB and its staff make no claims to inventions developed in the lab by User’s, but also make no additional provisions outside of University of Alberta collective agreements governing staff, to protect User’s intellectual property. The nanoFAB and its staff makes no guarantee for the security of User’s intellectual property or materials while these materials and information are within the nanoFAB or handled by staff. Ownership of rights for intellectual property resulting from User’s research shall be the responsibility of the User. In the case of a collaborative project involving nanoFAB employees, intellectual property rights will be shared under agreements worked out specifically for this collaboration and reviewed by University of Alberta Research Service Office.

 *The nanoFAB and its Staff will not be part of any secrecy or non-disclosure agreements having to do with work being performed in the nanoFAB*

## 0.3 Acknowledgements Requirements

The User acknowledges that their identity and affiliation may be made public in presentations, grants and reports and other materials describing the nanoFAB. The User further agrees that the nanoFAB or its staff will be acknowledged in publications or presentations resulting from substantive work performed at the nanoFAB.

To assist the nanoFAB in securing sustainable funding, please include the following acknowledgement within any publications:

### Publication Acknowledgement

*Part of this work was conducted at the University of Alberta nanoFAB Centre.*

## 0.4 Insurance

The University of Alberta provides no Workers’ Compensation or other Liability coverage for the User’s benefit. The User is deemed to be acting as a representative and/or employee of their affiliation during work at the nanoFAB. For non University of Alberta affiliated User’s, at their own expense and without limiting its liabilities herein, must insure their operations under a contract of General Liability Insurance, in accordance with the Insurance Act (Alberta), in an amount not less than five million (\$5,000,000) Canadian Dollars, insuring against bodily injury, personal injury and property damage. It is the responsibility of the User’s affiliation to ensure that they are adhering to all local, provincial and federal regulatory acts pertaining to employee occupational health safety and insurance requirements.

## 0.5 Liabilities

The User and their affiliated organization shall indemnify and hold harmless the University of Alberta, its officers, agents and employees from any and all claims, damages, demands, actions, liabilities and costs whatsoever that may arise directly or indirectly out of any utilization or interaction with the nanoFAB and its staff. The User understands that use of the nanoFAB may involve exposure to potentially hazardous conditions including, but not limited to, chemical, mechanical, electrical, thermal, and radiation hazards.

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# 1.0 nanoFAB User Expectations

## 1.1 Users Responsibility

All Users in the nanoFAB, at whatever level, are expected to identify the hazards associated with the activities for which they bear responsibility, to warn those who may be affected by them, and to take steps to ensure that health and safety of other Users will not be endangered.

Every User is required to take reasonable care for their own health and safety and that of others who may be affected by their acts or omissions at work. As such, any health conditions that may impact their usage of nanoFAB equipment and processes are to be reported to a nanoFAB staff member. All persons have a duty to not interfere with, or misuse, anything provided or organized in the interest of health, safety, or welfare.

## 1.2 Responsibility for new policies

New policies are posted on the nanoFAB website as well as the notice board at the entrance to the centre. It is each individual's responsibility to become familiar with and follow these policies. Ignorance of new policies that have been posted is not an excuse or a defense.

## 1.3 Information Transfer

The nanoFAB operates effectively when the staff is made aware of problems and issues in the centre. If there is a problem with a standard process not working, or a piece of equipment that is not working properly, nanoFAB staff must be informed. If we do not hear from the Users that there is a problem, we cannot fix it. If there is an issue, let staff know by submitting a new request via the LMACS.

## 1.4 User & Staff Guidelines

The nanoFAB recognizes that many Users are new to the areas of micro and nano- characterization and fabrication. However, the User is responsible for the success of projects undertaken within the nanoFAB. Upon training, the nanoFAB staff is available for guidance and support on how to get the best quality results from equipment and processes, including operational aspects of the equipment that may have been forgotten, support on processes within a staff members area of expertise, and general guidance.

For a User, the nanoFAB staff will:

1. Verbally correct the User if they see that they are having a straight forward issue running a tool that the User hasn't used recently or has just been trained on.
2. Provide, to the extent of their expertise in an area, advice to new Users on how best to proceed.
3. Help a User to get the best results possible with the equipment available in the nanoFAB.
4. Direct the User to the research and technical literature, so that the User may read these papers and gain greater understanding of their device fabrication or characterization procedures and processes.

Users are also expected to follow proper safety procedures at all times, report any unsafe situations or observed practices to staff, read relevant internal Standard Operating Procedures, properly log in and out of equipment, and never modify a piece of equipment without prior approval from staff.



*In all cases nanoFAB Users and staff are to be treated professionally and courteously at all times.*

## 2.0 Administration & Billing



This section deals with the registration, booking, fees, invoicing and other administrative policies within the nanoFAB. As a trust funded centre, the nanoFAB relies on a combination of operating grants and User fees to achieve sustainability. An in house, custom built, real time administration system called the Laboratory Management and Access Control System (LMACS) is utilized for all administrative functions, allowing for tracking and reporting of metrics which keep the nanoFAB competitive when writing grants or setting fees.

### 2.1 LMACS

LMACS is the nanoFAB's web-based User portal and administration system. This system serves as the main User portal to Users and is used for the majority of administrative tasks within the nanoFAB. Users will interact with the system on a day-to-day basis while working in the nanoFAB and there will be many references to this system throughout this policy guide. LMACS is a full-service User and project management system, with many tools to allow for efficient and effective management of group activities in the nanoFAB.

To login to LMACS, visit: <https://admin.nanofab.ualberta.ca>

### 2.2 Registration

Registration to the nanoFAB is mandatory for access to equipment, training, sample submission and group creation. All nanoFAB Users must register with the centre via the online LMACS system; both individual User accounts and group accounts are created through LMACS. A one-time \$200 administrative setup fee is charged per registered User in support of administrative overhead associated with ongoing operations, including LMACS.

1. Registration is quick and easy and can be completed entirely online. You can begin by following [this link](#) (click **Register**).

2. Quoted fee-for-service work does not require LMACS registration.

## 2.3 Fees

As a trust funded centre, the nanoFAB maintains competitive User fees for access to equipment to achieve sustainable operations. Fees are based on Canadian academic or non-academic affiliation, and are posted on our website for each piece of equipment. The fee web page also outlines caps and subscription models that are offered by the nanoFAB. The fee structure is reviewed and updated regularly. Please check our website for the most current fees.

## 2.4 Billing Policy

The following terms and conditions outline the nanoFAB Billing Policy. This policy covers administration of all nanoFAB generated invoices. All administrative inquiries related to nanoFAB invoices or billing can be directed to the nanoFABs administration office.

1. nanoFAB invoices are generated on a quarterly basis the first day of January, April, July and October, for the 3 month period ending the last day of the previous month. Invoices include all project specific charges including materials, services and equipment time for the previous three months.
2. Invoices are generated on a project specific basis and mailed to the project principle investigator (PI). PIs are responsible for ensuring their group members are aware of which project they are to charge against. Multiple projects can be created for a single PI.
3. Equipment rates for projects are based on posted Canadian academic, non-academic, industry or subscription rate schedules.
4. Invoices submitted to University of Alberta PIs can be paid by internal speed code by following the instructions provided with the invoice.
5. Invoices submitted to external PIs are administered by the University of Alberta Financial Services and are subject to a [University of Alberta 30% overhead](#) charge and GST.
6. It is the responsibility of every PI to ensure timely and proper payment of nanoFAB Invoices. Invoices will be considered outstanding if not paid 30 days after receipt of the following quarter invoice.
7. Outstanding invoices will result in accounts placed on hold and project Users denied access to the facility.
8. All nanoFAB invoice related questions, comments or inquiries regarding charges, payments or other activities on invoices that are in dispute, or should alternative payment arrangements be necessary, should be directed to the nanoFAB Administrative Assistant.



The Billing Policy will be reviewed on a yearly basis for implementation on September 1.

## 2.5 Billing and Booking System

The nanoFAB uses the LMACS system for accurate invoicing of research groups for their use of the facility.

Users must login to all equipment via the LMACS system while using it to ensure proper billing occurs. These billings are critical to ensure that the facility has sufficient funding to continue operating at the level required by the Users.

If there is a problem with the LMACS system (such as forgetting to log out or log in, or system crashes), please contact the Administrative Assistant as soon as possible (via email or personally) to tell him/her what corrections are needed.

On equipment that is in heavy demand the nanoFAB reserves the right to implement special booking rules to the instrument (to ensure fair access to all Users).

Equipment must also be booked through the LMACS system :

- Users who book equipment in advance have priority over Users who do not.
- If a User is more than 15 minutes late for a booking without notifying staff they may lose their scheduled time slot and be subject to a no-show charge as outlined in the [booking cancellation policy](#).
- Bookings can be canceled by following the [booking cancellation procedure](#) and are subject to the [booking cancellation policy](#).
- Users should finish processing in a timely manner as to not impede other User bookings.
- Conflicts regarding access to equipment and its surrounding workspace: Priority will be given to a User who has booked the equipment, followed by whomever is logged in to the equipment.
- Users are to log themselves in before processing and out once processing is complete.
- Special permission must be given to any User that wishes to reserve a piece of equipment for more than 24 hours over any 48 hour period.
- Equipment bookings that require equipment configuration changes must be made at least 24 hours in advance.

## 2.6 Mask Pricing and International Shipping Policy

The following terms and conditions are enacted as the nanoFAB optical mask pricing and international shipping policy. This policy covers administration and pricing of optical masks to ensure consistent mask production to Users and simplified administrative overhead; all prices listed below are in CAD.

1. The pricing for photomask fabrication depends on the mask size, the lens used for exposure, and whether the customer is academic (affiliated with a Canadian educational institution), or external (not affiliated with a Canadian educational institution, such as industrial Users or international academic Users), as given by the project type for billing. The pricing does not depend on the device density or overall exposed area on the photomask.

Mask size	Lens	Academic	External
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5 x 5	10 mm	\$185	\$278
7 x 7	10 mm	\$370	\$556
5 x 5	4 mm	\$379	\$570
7 x 7	4 mm	\$758	\$1140

- Shipping charges are applied directly to Users with Freight on Board to the University of Alberta shipping dock. Users requiring shipping must submit a Courier Account Number during the online submission process. Masks requiring shipment without a Courier Account Number will be invoiced \$150 for shipping (within Canada).
- A \$25 handling surcharge will be applied to masks requiring shipping. This fee covers the cost of packaging and administrative overhead.

 Optical mask pricing and shipping policy will be reviewed on a yearly basis for implementation on September 1.

## 3.0 User Access

The nanoFAB is an open access centre available to anyone interested in utilizing the available equipment and expertise, regardless of background or affiliation.

 The nanoFAB is open 24 hours a day except for an annual winter shutdown (where the entire University is closed) and other periodic maintenance shut-downs. The centre is staffed from 8:00 am to 5:00 pm M-F (except holidays). The policies for working in the nanoFAB are broken down into two categories:

- Regular Hours** – regular staffed hours, typically 8:00 a.m. to 5:00 p.m., Monday to Friday
- After Hours** – all other times, including special circumstances with limited staff onsite

### 3.1 Gaining Access

The first step in gaining access to the nanoFAB is to create an LMACS profile. This can be done by visiting the [LMACS](#) homepage and clicking **Register**. The Laboratory Management and Access Control System (LMACS) is an online, real time, project management system used by the nanoFAB for all day to day administrative tasks. The LMACS is used for booking equipment, viewing equipment usage, project management, making requests (training, maintenance) and a number of other administrative functions. As a Principal Investigator of a project, you have complete control over all activities within your project through the LMACS

 A one-time \$200 administrative fee is charged for all new registrants. If you are a Principal Investigator (PI) wishing to create a new group, this can be done upon activation of your account.

The following definitions are key to understanding the access and billing policies within the nanoFAB.

<b>User</b>	In order to access the nanoFAB you <i>must</i> create an LMACS profile. Once this process is completed you will become a registered User. As a User, you can be added to projects in order to perform work within the centre. A User can be a member of any number of projects.
<b>Project</b>	Projects are containers for charges within the nanoFAB. The project type will determine the billing rate when accessing equipment and services (ie. <i>Internal</i> vs. <i>External</i> ). Projects are owned by Groups who are financially responsible for the charges accumulated.
<b>Group</b>	Groups represent a specific research group or business. Each group should have a single User who is designated as the owner. This individual will be financially responsible for any charges added to projects that they control.

Creating your account involves the following steps:

- Complete the registration form found on the [LMACS](#) home page or on this [website](#). An activation link will be sent to your email.
- Click the activation link within 24 hours or you will need to start over. A confirmation email will be sent.
- Follow the instructions in the email to configure your account. During this stage you can select to join an existing project or create a new Group and Project.

 Only create a new group if you will be financially responsible for the work completed in the nanoFAB.

### 3.2 Requesting Training / Services

Access to all nanoFAB resources is facilitated through the LMACS system by creating **Requests**. For information on how to use the request system within LMACS please review the slide shows below:

- [Submitting a Request](#)
- [Elaborating a Request](#)
- [Assigned Tasks](#)

Once a User account has been created, and configured the User will have access to the LMACS system to create new requests. Once the request has been submitted it will be reviewed internally by the nanoFAB and directed to the appropriate staff member for processing.

### 3.3 Levels of Access

Centre access will lapse after 12 months of account inactivity when nanoFAB profiles become inactive. At this point the User will need to re-activate their account and re-take the safety orientation. This can be done online through the "**re-activate**" link on the sign-in page.

Individual tool access may expire after a period of inactivity; this period is tool specific. Upon expiry, individual tool access status will revert back to *Trainee*: to regain access to the tool, training for requalification is required (at the discretion of the designated trainer). This retraining is required both to verify user proficiency on equipment operation, as well as to ensure the user is aware of any tool policy changes which may have occurred. Logging into equipment on LMACS without actually using the tool, so as to "reset the clock" with respect to expiry, is not allowed: actual tool usage is required to count as activity.



All training and access requests are to be initiated by the individual User using the LMACS system

#### Centre Access

<b>User</b>	<ol style="list-style-type: none"> <li>1. Must have completed the Mandatory Training Course &amp; Safety Orientation.</li> <li>2. Must have attained <i>User</i> status on at least one nanoFAB tool.</li> <li>3. Access: 8:00 AM to 5:00 PM weekdays.</li> </ol>
<b>Colleague</b>	<p>Must meet all of the User requirements as well as:</p> <ol style="list-style-type: none"> <li>1. Have minimum of Colleague status on at least one nanoFAB tool.</li> <li>2. Access: 24 hours.</li> </ol>

#### Individual Tool Access

<b>Trainee</b>	<ol style="list-style-type: none"> <li>1. Must have completed the Mandatory Training Course &amp; Safety Orientation.</li> <li>2. Must be accompanied by the designated trainer when training on a new tool. Cannot book equipment or process without supervision.</li> <li>3. Access: 8:00 AM to 5:00 PM weekdays</li> </ol>
<b>User</b>	<ol style="list-style-type: none"> <li>1. Must meet all of the <i>Trainee</i> requirements.</li> <li>2. Must have met the training requirements and have been signed off on that tool by a staff member.</li> <li>3. Access: 8:00 AM to 5:00 PM weekdays.</li> </ol>
<b>Colleague</b>	<ol style="list-style-type: none"> <li>1. Must have met all of the <i>User</i> requirements.</li> <li>2. Access: 24 hours.</li> </ol>

### 3.4 Working in the nanoFAB (regular & after-hours access)



All equipment and processes in the nanoFAB are subject to a Hazard assessment ([sample](#)). The assessment is used to classify the process into one of three *Risk Categories* as described below. The policies for performing processes in each of the categories is described below for both regular business hours as well as after hours.

#### Risk Categories

Upon completion of the Hazard Assessment, the highest risk factor identified will be used to classify the process / equipment.

<b>Low Risk (1-2)</b>	<p><i>Low Risk items are deemed to pose little to no risk to people or equipment.</i></p> <p><b>During Regular Hours:</b></p> <ul style="list-style-type: none"> <li>• Use standard laboratory handling procedures as defined in the SOP</li> </ul> <p><b>After Hours:</b></p> <ul style="list-style-type: none"> <li>• Use standard laboratory handling procedures as defined in the SOP</li> </ul>
<b>Medium Risk (3-5)</b>	<p><i>Moderate risk to people or equipment. This covers the majority of the equipment in the cleanroom as the environment poses a moderate risk (chemicals, hazardous gasses, hot surfaces, sharp objects etc..)</i></p> <p><b>During Regular Hours:</b></p> <ul style="list-style-type: none"> <li>• Use standard laboratory handling procedures as defined in the SOP</li> </ul> <p><b>After Hours:</b></p> <ul style="list-style-type: none"> <li>• Use standard laboratory handling procedures as defined in the SOP</li> </ul>
<b>High Risk (6-9)</b>	<p>High risk to either people or equipment. Processes or equipment falling into this category require additional precautions to ensure the safety of the User and / or equipment.</p> <p><b>During Regular Hours:</b></p> <ul style="list-style-type: none"> <li>• A User must notify at least one other individual that they are about to begin a high-risk task or process. The User must confirm that the other individual will be present for the duration of the task. The other individual is not obligated to agree.</li> <li>• The other individual must be in the lab space. They can be anywhere in the lab space, and do not need to be within arm's reach. They must be within earshot.</li> <li>• If the User cannot locate another individual they cannot perform the process.</li> </ul> <p><b>After Hours:</b></p> <ul style="list-style-type: none"> <li>• A User must arrange to have a qualified buddy present in the lab space for the duration of the task.</li> <li>• Administrative procedures to enforce this policy are pending</li> </ul>

## After-Hours Access

All Users requesting after-hours access must:

- Submit a formal request for access to the process and equipment they wish to use – to be approved by the nanoAB. Visit [After Hour Access Policy\(Equipment\)](#)
- Complete a [hazard assessment](#) of the process they wish to use and submit it to the nanoFAB for approval
- Supply a list of potential buddies for review (for high-risk processes)



### Qualified Buddy

- An active nanoFAB User
- Has completed the appropriate safety orientation for the location of the equipment
- Has been approved by the nanoFAB to act as a buddy for the particular task or process

## 4.0 Day to Day Operations

It is important that all Users understand the day-to-day policies that are in place within the nanoFAB. The majority of these policies are enacted to ensure fair access to the limited space and resources available to all.

### 4.1 Storage Box Policy

The following terms and conditions are enacted as the nanoFAB clean room storage box policy. This policy is necessary to ensure that the limited clean room storage space available is efficiently allocated. Administration and processing of the Storage Box Policy will be handled by the nanoFAB Administration Office.

1. Storage boxes will only be assigned to registered local active nanoFAB Users.
2. The nanoFAB reserves the right to restrict the total number of individual storage boxes per group (academic or industrial).
3. Rental costs for storage boxes are based on the classification of the space the storage is located in. Refer to the [Storage Pricing Policy](#) for details. Charges will be applied to an active project either annually or monthly.

4. External Users will not be allowed to maintain or store items in a storage box upon completion of work within the cleanroom. Exceptions can be accommodated on a case-by-case basis; please speak with a nanoFAB training staff member.
5. Inactive nanoFAB Users cannot have storage boxes. If a box belongs to an inactive User an email will be sent requesting removal of contents or transfer of ownership. Contents of the box are subject to removal.
6. Users (active or inactive) receiving an email from nanoFAB staff requesting action on their storage box will have 30 days to comply. After such time, contents of the box are subject to removal.
7. Absolutely no chemical storage is allowed in storage boxes. The nanoFAB provides a variety of safe chemical storage options for clearly labeled chemicals.
8. Only clean-room compatible items can be stored inside storage boxes located in the Class 100 clean room. For a complete list, or clarification of compatible items, please check with a nanoFAB staff member.
9. Regular audits of storage box use and adherence to the Storage Box Policy will be done.
10. This policy will take effect September 1, 2019 and will be reviewed regularly. Notification of changes will be implemented through postings on the nanoFAB website and through a policy change notification email to the nanoFAB community.
11. Any contents that are removed from storage boxes will be stored for 6 months, after which time they will be disposed of.

## 4.2 Lost & Found

All samples, masks or other items not stored in your locker at the end of the day will be placed in the lost and found box located in gowning. The items in the lost and found box will be disposed of at two-week intervals.

## 4.3 Equipment & Tools

Equipment can be used only for its designed purpose and in a manner for which it was intended.

- It is the expected to leave a tool in as good, or better condition than when processing begun.
- It is the Users responsibility to report any malfunction of equipment to the nanoFAB. All reports should be made through the LMACS system.
- All logbooks must be filled in every time a User uses a piece of equipment.
- Altering or modifying any piece of equipment without authorization from the nanoFAB staff is prohibited.
- Treat all tools with care and use them in a safe manner for their intended purpose.
- Return any tools that you use in a clean, undamaged condition to the drawer or storage area where they came from.
- Report lost or damaged tools to nanoFAB staff as soon as possible.
- Conflicts regarding access to equipment and it's surrounding workspace: Priority will be given to a User who has booked the equipment(\*), followed by whomever is logged in to the equipment.

*\*see 15 minute rule in Billing & Booking section*

Standard operating procedures for each piece of equipment are posted on our website.

No equipment can be removed from the nanoFAB without the permission of the nanoFAB staff.

## 4.4 Tours

The nanoFAB welcomes tours of its facility by any group. Small (one or two people) self-guided tours do not need to be pre-arranged with the nanoFAB: the User or tour guide can simply bring the tour groups to the facility. These self-guided tours are restricted to the hallways surrounding the cleanroom and characterization lab. For guest/visitor access to the cleanroom and/or the 10k area, please see Section 4.5.

For tours of 3 or more people, refer to the how-to guide: [Request a guided tour](#)

## 4.5 Visitors/Guests

Any currently active nanoFAB User may submit a request to bring guests into the centre (one-time access). For the request to be approved, the User must have attained at least a **User** status on at least one piece of equipment in the area they wish to visit. Please note that guests are allowed in nanoFAB lab spaces during normal, staffed business hours only, regardless of whether or not the host User has after-hours access to any lab space.

Refer to the "[request access for a guest](#)" how-to for complete details.

The intent for the guest process is to accommodate Users who wish to give guests a taste of the experience of working in the cleanroom, and/or to see some details of a process of interest first hand. For situations where multiple visits to the cleanroom or 10k are desired, the guests must register as nanoFAB Users and request a cleanroom safety orientation, after completion of which they may enter the cleanroom and 10k area at will.

## 4.6 PVD Deposition Material Policy

As a convenience to our User community, the nanoFAB supplies many materials for magnetron sputtering and electron beam evaporation. Please consult the nanoFAB for a list of available materials. The use of the nanoFAB provided deposition materials is excluded for:

1. Depositions greater than the listed thicknesses
2. Reactive sputtering
3. Co-sputtering
4. Any process deemed non-standard for contamination, material compatibility, or other undetermined reasons

In these instances, or if a high level of contamination control is required, it is the responsibility of the User to supply their own deposition materials. Once a User has determined which material and deposition technique is required, it is also the responsibility of the User to ensure both the material (see [Chemical/Material Import Policy](#)) and process (see Project Proposal) have been approved by the nanoFAB. Please note, precious metals are noted below in bold (Au, Pt, Pd) are billed solely on a cost recovery basis based on weight used. Other materials as listed on the next page may be used at no additional cost beyond equipment hourly rate.

## 4.7 Equipment & Facilities Problems

If a User encounters a problem with a piece any of equipment, it is the responsibility of the User to ensure the system is in a safe state before continuing. If the User is unsure of the state of the piece of equipment, contact a staff member immediately. At all times, be aware of your own safety and that of other lab Users.

### Major Problem – Damaged, Safety Concern, Flood, unknown state, etc.

- Daytime: Contact Staff Immediately – follow their instructions
  - Report the incident using the LMACS system
- After hours:
  - Phone After-Hours Contact immediately. This can be found in the Emergency binder in gowning.
  - If unable to contact above, contact U of A Controls Center: 780-492-4855
  - If required, phone 911
  - Report the incident using the LMACS system

### Minor Problem – Minor Performance Issue, Uncommon Performance noticed, etc.

- At all Times
    - Report the incident using the LMACS system.
    - If necessary, place a "Down" sign on the tool. These can be found at the nearest toolbox.
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## 5.0 Laboratory Protocols

This section deals with policies related to personal hygiene, PPE, and lab attire.

### 5.1 Personal Hygiene

All nanoFAB lab spaces are [Scent-Free Environments](#), as per Faculty of Engineering policy. Additionally, no make-up, perfume, cologne, aftershave, or scented lotions may be worn in the cleanroom. Users must not smoke for at least four hours prior to entering the cleanroom or 10k area. If it is discovered that you have violated these guidelines you will be asked to leave until you have corrected the problem. Continued violations will result in disciplinary action.

### 5.2 Footwear

Flat-soled, closed-toe footwear must be worn in all nanoFAB lab spaces. Additionally, shoe covers must be worn at all times in the cleanroom (ECERF W1-060), 10k area (ECERF W1-060), and TEM room (CMEB L2).

### 5.3 Clothing

Long pants must be worn in all nanoFAB lab spaces; shorts, capris, skirts, etc. are not allowed. Additional lab attire may be required depending on the specific lab space (e.g., bunnysuit and gloves in cleanroom; bouffant cap, gloves, and lab coat in 10k area).

### 5.4 Safety Glasses

Safety glasses **must be worn** during any chemical handling, processing involving chemicals, or tool use where there is a potential danger of flying particles or specimens (e.g., spin-coaters). Safety glasses may be removed only when using inspection microscopes or performing other close inspection work, but they must remain with each User and must be donned immediately after the inspection is complete.

### 5.5 Personal Listening Devices

Personal listening devices are permitted, but **one ear must be clear** to ensure the User can hear alarms in the facility.

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## 6.0 Safety

This section deals with all aspects of safety within the nanoFAB

### 6.1 Safety Committee

The [Safety Committee](#) acts as an advisory body in all matters of safety. All persons are encouraged to promptly bring to the attention of the nanoFAB staff or any Safety Committee member any apprehension as to hazards or unsafe practices in their work area.

The committee performs the following:

- Identify hazards and draft appropriate policies.
- Review incident reports and provide corrective actions.
- Recommend changes to the nanoFAB Policy Manual.
- Provide updates on safety information.
- Maintain the nanoFAB's ability to handle accidents and emergencies.
- Oversee Safety Orientations.
- Ensure Users meet WHMIS compliance.
- Regular safety checks of emergency equipment & PPE.

## 6.2 Safety Concern Form

All Users are encouraged to report all concerns, incidents, near misses, and unsafe acts they encounter or observe while working at the nanoFAB. All reports should be made through the LMACS system.

The purpose of this policy is to bring to the attention of the Safety Committee such concerns in order for the committee to recommend corrective actions to prevent similar or more serious incidents from happening and to initiate new policies to deal with new hazards.

## 6.3 Emergency Procedures



All persons working in the nanoFAB must read the complete [Emergency Response Plan](#).

In addition to standard Fire Alarm Lights, there are also light towers located in many locations throughout the facility (as shown below). These towers are used to indicate the status of a great number of facility conditions that are monitored.

	<p>Facility Status Lights</p>	<ul style="list-style-type: none"> <li>• Fire Alarm: ACTION: IMMEDIATELY EVACUATE nanoFAB</li> <li>• Flashing Red: Hazardous Gas Alarm ACTION: IMMEDIATELY EVACUATE nanoFAB</li> <li>• Flashing Amber: Facilities Alarm ACTION: Ensure staff is aware</li> <li>• Flashing Blue: Water Related Alarm ACTION: Ensure staff is aware</li> <li>• Solid Blue: NORMAL ACTION: N/A</li> </ul>
	<p>Fire Alarm Lights</p>	

If you are in the clean room during a Fire Alarm or a Hazardous Gas Alarm the alarm occurs, Do NOT remove your bunny suit, evacuate immediately.

### Injuries

- All injuries must be reported immediately to a nanoFAB staff member.
- Any Users are expected to cease work to assist an injured person.
- When trips to UofA Hospital Emergency are necessary, another person must accompany the affected person(s). If chemical exposure is involved, a nanoFAB staff member will also be sent.
- If deemed necessary, phone 911 and request an ambulance be sent to ECERF for the injured User.
- An online safety concern form must be completed.

## 7.0 Chemical Safety Issues



All persons handling any chemicals in the nanoFAB must read the complete [Chemical Spill Response](#) procedure.

This section deals with all aspects of chemical handling.

## 7.1 Authorization

Only persons who have been trained and reached User status on specific chemical processes may handle chemicals. Trainees must be supervised and receive explicit permission from the person training them before handling chemicals.

## 7.2 Material Safety Data Sheets

Physical SDS sheets for chemicals used at the nanoFAB are organized alphabetically in binders which are located in the characterization room. Digital versions of SDS sheets are available in the [Safety Data Sheet \(SDS\) Repository](#).

## 7.3 Wet Processing Areas

Wet etch processes will only occur in designated wet etch areas. These are: the two wet decks and fume hoods in the wet etch room. The fume hoods can only be used for processes that have been approved by the nanoFAB Director and/or process staff. The preferred site for most processing is the wet decks. The wet deck in lithography is only for lithographic wet processing (solvents and developers only). There are great dangers if incompatible wet etch solutions are used on the same wet deck. If a wet deck is being used for an acid etch, only acid processing can occur on this deck (until it is cleaned up). This is also true for organic, base, and piranha solutions.

The User who books a wet deck has first rights to which process (acid, base, organic) that will occur on the wet deck during their processing. This User can decide if other Users can share the wet deck during their processing or not. The User who has booked the system has the right to say "Sorry, but I have booked the wet deck and I cannot share the deck".

The Aisle 2 wet deck is dedicated to piranha cleaning. If you require a piranha solution, you can use this wet deck for your processing. There will often be a number of piranha solutions on this wet deck, as it takes time for the solutions to cool before disposal.

All wet decks should be cleaned and dried once you have finished working on them.

## 7.4 Labeling Containers of Chemicals

All containers **MUST** be labeled with the User's name, the date, and what chemical is in the container, **BEFORE** the chemical is poured. For situations in which it is difficult to write this information legibly on the container itself (e.g., very small containers such as 50 mL beakers, or glassware immersed in sonicator baths), one may instead write the required information on a cleanroom wipe, placed under or next to the container. All labels must be removed once the containers have been cleaned and before they are put back on the drying rack or shelf.

Containers for long-term storage must have the User's name, the chemical, and the date on them. If not, the solutions will be disposed of.

## 7.5 Clean up after processing

All Users must clean up after they are finished processing in an area. This means wiping the area down, removing the containers from the dump rinser, and cleaning anything that is required. It is the responsibility of the User to ensure the area is as clean as, or cleaner than, how they found it.

## 7.6 Importing Chemicals

Any person who wishes to bring a chemical onto nanoFAB premises must obtain approval from nanoFAB staff. If the chemical that you wish to bring in is listed in our [SDS repository](#) then you must talk to nanoFAB staff in regards to handling and storage procedures. However, if the chemical does not appear in our [SDS repository](#) then permission from one of the nanoFAB Chemical Technologists must be received. If the chemical has not been used, previously, in the facility, the staff member and the User must determine the safety concerns with the chemical (if any) and develop procedures for safely working with this chemical. The procedure of bringing a new chemical into the facility can be found in the [Chemical/Material Import Request](#) page.

The procedure for bringing a new chemical into the facility is:

1. Acquire SDS sheets for the chemical (from at least two suppliers or web sites if possible).
2. Read and understand the SDS sheet.
3. Determine how much of the chemical will be used during processing.
4. Research the common concerns are with this chemical, procedures for handling, and disposal.
5. Complete a [chemical import request in LMACS](#).
6. It will be determined if the chemical can be handled safely in the facility (this could entail research by the User into proper handling techniques).
7. If approved, the User and the appropriate nanoFAB staff will develop safe procedures for working with the chemical.



Note: No chemical may be brought on-site without prior nanoFAB approval.

If a User is found to be working with an unapproved chemical or any chemical in an unsafe manner, disciplinary action may occur.

## 7.7 Empty Chemical Bottles

Empty bottles should be rinsed three (3) times by the Users who empty the bottle. The bottle should be labeled as a "Washed Bottle" and deposited in the washed bottle bin. Empty photoresist bottles should not be rinsed. They will be disposed of as toxic waste.

## 7.8 Hazardous Chemical Gear (Heavy Gloves and Capes)

Protective chemical gear is not to be worn outside the two wet processing aisles. The gear must be removed before leaving the wet processing area or handling any equipment outside the wet processing area. The gear must be cleaned and dried before putting it away.

## 7.9 Emergency Telephone Numbers

- EMERGENCY 911
- CAMPUS SECURITY 2-5050
- Michael Hume 780-953-5081

### **FIRE or LIFE EMERGENCY**

- Call 911
- Identify yourself
- Tell them what the emergency is:
- Tell them the location: nanoFAB W1-060 ECERF Building 9107-116 Street

## 7.10 Chemical Hazards

A variety of chemical hazards exist in the nanoFAB. nanoFAB Users are expected to educate themselves about chemicals, take the necessary precautions associated with chemicals, and conduct themselves in a safe manner when handling chemicals.

### **Hydrofluoric Acid (HF)**

HF burns are extremely serious and result in massive tissue damage. HF burns may not cause discomfort until long after exposure. If a User contacts HF, or suspects they have contacted HF, flush the area well with water for 1 minute. Apply calcium gluconate gel to the affected area. Contact nanoFAB staff immediately.

Calcium chloride is used to neutralize solutions containing HF. It is added in a 3 to 1 ratio before aspiration.

Further safety instructions are in the Standard Operating Procedure.

### **Piranha**

Piranha is only used in a designated area. No other process is allowed on this designated wet deck. Further safety instructions are in the Standard Operating Procedure.

### **Cryogenic Liquid Nitrogen (LN2)**

Cryogenic hazards exist in the nanoFAB. nanoFAB Users should familiarize themselves with cryogenic materials to avoid injury.

LN2 is used throughout the lab. LN2 has a sufficiently low temperature, -196°C (77°K), to burn skin from freezing and to crack the flooring. nanoFAB Users should take all necessary precautions when working with or around LN2.

- Only authorized personnel may fill LN2 containers.
- Only containers designed for transporting LN2 are allowed.
- Special gloves must be worn when handling LN2

### **Reproductive**

Because of the potential exposure to chemicals, working in the nanoFAB while pregnant is at the Users own risk.

## 8.0 User Discipline

This section contains User discipline policies. Also See: [Discipline Policy](#)

### 8.1 Disciplinary Policy

Because of the communal laboratory environment, expense of equipment, dangers in the facility, and the fragility of other Users' devices/processes /work, Users and staff of the nanoFAB need to act accordingly. Therefore, it is the responsibility of all our Users to help contribute to a safe working environment. The following Disciplinary Policy has been developed to ensure a safe working environment.

 It should be noted that all violations and disciplinary actions are tracked and documented with the nanoFAB Laboratory Management and Access Control System (LMACS). The nanoFAB promotes the use of the LMACS for all requests, including safety, maintenance, and other concerns that may led to disciplinary action.

### 8.2 Disciplinary Actions

All nanoFAB staff have the authority to immediately suspend Users' work in the nanoFAB due to breaches of policy, safety, or commonly held laboratory practices and behaviours. Subsequently, further disciplinary actions may follow through a review process involving the User.

#### **Warnings**

Warnings are for minor infractions of nanoFAB safety, policies, or commonly held laboratory practices, observed by either staff or Users. Warnings will be communicated to the User verbally and/or via email. The cause of the warning will be discussed by the staff member and the User. Warnings are communicated directly to the User and recorded in their LMACS profiles. Further or frequent warnings may result in disclosure of incidents to the supervisor.

#### **Suspension**

Suspensions are for serious or major infractions of nanoFAB policies, training, or safety. Suspensions are also to deal with Users who are disrespectful or disruptive to the community, the working environment within the nanoFAB, and nanoFAB staff.

Suspensions are a form of serious discipline and are issued by nanoFAB staff.

Users issued a suspension will have their nanoFAB access revoked until further notice. When a suspension is given, an email will be sent to the User and their supervisor, notifying them of suspension of access and scheduling of a follow-up discussion. The meeting will be attempted to be scheduled within 5 business days.

Warnings or suspensions can lead to one or more disciplinary actions, if a review of the User's actions deem it appropriate. Disciplinary actions will be communicated by the nanoFAB via email to the User and their supervisor.

Types of disciplinary actions may include, but are not limited to:

1. **Minor Discipline** – Issued for any warnings or suspensions. This may include, but is not limited to, revoking after-hours access to tools or the nanoFAB, tool retraining, repeating safety orientation, written follow-up report of incident.
2. **Expulsion** – Issued for egregious or continued violations. Expulsion from the nanoFAB can be issued up to a maximum of 12 months.

### 8.3 Appealing Disciplinary Action

The User, or Principal Investigator, may appeal to the Associate Dean (Research) of the Faculty of Engineering regarding any disciplinary action from the nanoFAB. All previous User history within the nanoFAB will be made available in consideration of a final decision.