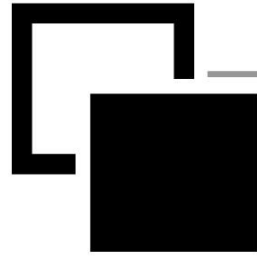


University of Alberta



**Nano
Fab**

**A Micro-Machining &
Nanofabrication Facility**

Policy Manual

Safety, Administration and Training

July 2011

(ver2.6)

**W1-060 ECERF Bldg
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Introduction

The NanoFab is committed to promoting the highest standards of competence, practice and safety among all staff, users, and visitors. This manual is addressed to all NanoFab users and outlines policies, procedures and safety guidelines that must be followed to ensure safe and efficient operations. All users are expected to review this manual and all procedures and policies outlined must be observed while working within the NanoFab. Any questions or concerns should be directed towards a NanoFab staff member.

NanoFab Director

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The following document is intended to make NanoFab staff and users aware of facility policies and outline user responsibilities to themselves and to other individuals within the facility.

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 he/she bears 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 his/her own health and safety and that of other persons who may be affected by his/her acts or omissions at work. 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 safety policies are sent to all key holders via email, are posted on the facility website and within prominent locations throughout the NanoFab. 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 NanoFab staff is aware of the problems and issues in the facility. 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. Please, if there is an issue, let the NanoFab staff know by completing an Equipment and Safety Concern form found on our website.

2.0 Administration & Training Policy

2.1 NanoFab Access

Access to the NanoFab is approved upon completion of the following:

1. For billing purposes, the users Research Group/Organization must be registered with the NanoFab.
 - Our New Group Registration Form can be found on the User Forms page of the NanoFab website.

2. You must be a registered user of the NanoFab.
 - Our New User Registration Form can be found on the User Forms page of the NanoFab website.
3. All users must submit a “*Project Proposal*” for approval.
 - Download our Project Proposal [Editable Template] on the User Forms page of the NanoFab website.
 - View an example of a Project Proposal [Example] on the User Forms page of the NanoFab website.
4. All users must take the Introductory Safety Training class, which is a two hour lecture held every two months (January, March, May, July, September & November).
 - Cost for this course is \$200.
 - Once steps 1-3 are completed, a NanoFab staff member will enroll the user in the next available class. This will be confirmed by email.
5. Upon completion of our Introductory Safety Training class, the user will be prompted to register for one of our Safety Orientation sessions. At the end of this session, there will be a safety quiz in which the user is expected to pass.

2.2 Training

Once a user has gained access to the NanoFab as mentioned in section 2.1 of the Policy Manual, the user is now eligible to receive training on the equipment/process needed in order to work on their project. The initial training will be liaised by Stephanie Bozic. Once the user is in contact with Stephanie, they will discuss the project and determine the tools and processes required so that a specialized training schedule can be developed.

2.3 Single Equipment Use

Consideration will be given on a case by case basis for those who only require access to a single tool & don't feel they need to complete the NanoFab access steps (as described in section 2.1 of this manual. A “Project Proposal” will still be required for proper assessment by NanoFab staff.

2.4 Fees

NanoFab fees are dependent on whether the user is academically or industrially funded and are posted on our website for each piece of equipment based on an hourly rate.

2.5 Levels of NanoFab Users

User Levels

Three levels of users: Trainee, User and Colleague

Trainee:

1. Must have completed the mandatory introductory course.
2. Cannot enter clean room portion of facility without approval and must be accompanied by the person training them when learning a new piece of equipment. The trainer **MUST** be approved to train users by the NanoFab staff.
3. Access: 8:00 AM to 5:00 PM weekdays.
4. Cannot book equipment or process on their own.
5. Will be only authorized to use equipment once they have passed the training and have been signed off on that piece of equipment.

User:

1. Passed training course.
2. Have at least user status on one piece of equipment.
3. A user can train other users with NanoFab permission but sign-off must be done by NanoFab staff.

Colleague:

1. The same as User level but with 24 hour access on a specific piece of equipment.

2.6 Staffed Hours and After Hours Access

The NanoFab is open to users 24/7, but this access is moderately restricted. The facility is staffed from 8:00 am to 5:00 pm M-F (except holidays). During this time, all users can access the facility and all processes are available. For after hours access please refer to **Appendix E**.

3.0 NanoFab User/Staff Guidelines

The NanoFab recognizes that many users are new to the areas of micro and nanofabrication. However, the user is responsible for the success of projects undertaken within the NanoFab. Upon training, the NanoFab staff is available for guidance on how to get the best quality results from equipment, operational aspects of the equipment that are forgotten, support on processes within the staff's 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 procedures and processes.

Users are also expected to follow proper safety procedures at all times, report any unsafe situations or observed practices to NanoFab 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 NanoFab staff.

In all cases NanoFab Users and Staff are to be treated professionally and courteously by everyone at all times.

3.1 Disciplinary Policy

Because of the expense of equipment, dangers in the facility and the fragility of other user's devices/processes, users and staff of the NanoFab need to act accordingly. The NanoFab promotes the use of our on line Safety Concern Form by all NanoFab users. It is the responsibility of all our users to help contribute to a safe work environment. The following Disciplinary Policy has been developed to ensure a safe work environment for all of our users. It should be noted that **all violations and disciplinary actions are tracked and documented.**

3.1.1 Disciplinary Actions

All NanoFab staff may issue Yellow Cards and Red Cards if a breach of Policy or Safety violation is observed.

Initial Disciplinary Actions are defined as follows:

1) Yellow Card – Minor infractions against NanoFab Safety or other Policies that are observed by either staff or users. Yellow cards will be communicated to the user verbally and via email. The cause of the yellow card will be discussed by the staff member and the user. **The yellow card is a warning that a user has broken a minor safety infraction or has not learned to use equipment correctly or adhere to NanoFab staff member directions.**

When a yellow card is given, an email will be sent to the user, their supervisor, and all NanoFab staff members.

Three yellow cards lead to a red card. (See Red Card below for information).

2) Red Card – Serious or major infractions of NanoFab Operational Policies or Safety Procedures. The “Red Card” is also to deal with users who are disrespectful or disruptive to the community working environment within the NanoFab.

Any staff member can give any user a RED card.

Upon issuing a Red Card, the user will be asked to clean up their work, if it is safe to do so, and leave the NanoFab immediately. Users issued Red Cards will have their NanoFab Account access suspended until further notice. All staff will be notified at the time of the issuing of a Red Card.

A Red Card results in the loss of NanoFab access until the appropriate staff members & a member of the management committee meet to determine the level of supplementary disciplinary action that is necessary. The meeting will be scheduled before the end of the next business day and can include the staff member, the training staff member, one or more of the management committee members, and any other staff, as required.

3.1.2 Supplementary Disciplinary Action

A Red Card can lead to one or more of the following Supplementary Discipline Actions listed below, if the results from the above meeting determine that this is appropriate. Once severity of discipline is determined, a management committee member will send an e-mail to the user and their supervisor or PI. All NanoFab staff will also be notified at that time.

Supplementary Disciplinary Actions are defined as follows:

- 1) **Minor Discipline** – A violation of a safety or operations policy of the NanoFab that is not considered serious enough for a suspension, but greater than a warning. This may include, but is not limited to, revoking after-hours access to the tool or NanoFab, tool retraining and or repeating safety orientation.
- 2) **Suspension** – All Red Cards lead to a same day suspension. Supplementary suspension from the NanoFab can be issued up to a maximum of 14 calendar days as a result of a Red Card or three Yellow Cards.
- 3) **Strike** – If sufficient previous disciplinary actions have not corrected behaviour or the severity of the violation warrants, or the user blatantly violates safety protocols that put others in danger, a strike will be issued in combination with other supplementary disciplinary actions.

Three strikes = permanent expulsion from the NanoFab (regardless of whether the NanoFab is critical for user research or graduation or not)

3.1.3 Appealing Permanent Expulsion/Removal of Access

The user, or user supervisor, can appeal to the NanoFab Committee (an advisory board of professors and industry professionals) on any permanent expulsion/removal from the NanoFab. All previous user history within the NanoFab will be made available to the NanoFab Committee in consideration of a final decision.

4.0 Safety Policy

4.1 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:

- 1) Identify hazards and drafts appropriate policies.
- 2) Review incident reports and provide corrective actions.
- 3) Recommend changes to the NanoFab Policy Manual.
- 4) Provide updates on safety information.
- 5) Maintain the NanoFab's ability to handle accidents and emergencies.
- 6) Oversee Safety Orientations.
- 7) Ensure users meet WHMIS compliance.
- 8) Regular safety checks of emergency equipment.

4.2 Safety Concern Reports

The purpose of the Safety Concern report is to encourage all individuals to report all incidents, near misses, and unsafe acts they encounter or observe while working at the NanoFab.

It is a NO FAULT incident reporting policy, which implies that the person being reported is not at fault for his/her actions. It is not intended to criticize or 'pick on' any person. The purpose of this policy is to bring to the attention of the Safety Committee such incidents in order for the committee to recommend corrective actions to prevent similar or more catastrophic incidents from happening and to initiate new policies to deal with new hazards.

Safety incident forms are available in the cleanroom or on-line at our website under the "User Forms" link.

4.3 Emergency Procedures

Hazardous Gas Alarm & Facility Status Lights

Flashing Red: Evacuate the NanoFab – This is the NanoFab Hazardous Gas Alarm. **Leave the lab immediately.** Assemble outside of the front doors of the ECERF building. Flashing red is the only light the users need to be aware of.



Fire Alarms

- If there is a fire alarm in ECERF, immediately leave the NanoFab and the building. Meet at the front entrance to the ECERF building (NW corner).
- If you are in the clean room when the alarm occurs, Do NOT remove your bunny suit. Immediately leave the area and meet outside as previously described.

Injuries

- All injuries should be reported immediately to a NanoFab staff member.
- Any users are expected to cease work to assist an injured worker.
- When trips to U. of A. 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. Immediately contact a NanoFab staff member.
- A safety concern form must be completed.

5.0 Chemical Safety Issues

5.1 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.

5.2 Material Safety Data Sheets

MSDS sheets for chemicals used at the NanoFab are organized alphabetically in binders which are located in the characterization room. A sign shows the location of the binders.

5.3 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 can not 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.

5.4 Labeling Containers and Etch Solutions

All containers **MUST** be labeled with the users name, the date and what chemical is in the container. You must also remove the label once the containers have been cleaned and before they are put back on the shelf.

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

5.5 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.

5.6 Importing Chemicals into the NanoFab

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 MSDS binders then you must talk to NanoFab staff in regards to handling and storage procedures. However, if the chemical does not appear in our MSDS binders 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 is called the ‘Chemical Import Policy’.

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

- 1) Acquire MSDS sheets for the chemical (from at least two suppliers or web sites if possible).
- 2) Read and understand the MSDS sheet.
- 3) Determine how much of the chemical will be used during processing.
- 4) Try to determine by talking to knowledgeable people (other NanoFab users, the Internet, etc), what the common concerns are with this chemical, procedures for handling, and disposal.
- 5) Fill out the Chemical Import Form.

[Chemical Import Form](#)

- 6) Bring the Chemical Import Form, MSDS sheets and any other information to either Stephanie or Jolene (Room W1-053).
- 7) They will determine if the chemical can be handled safely in the facility (this could entail research by the user into proper handling techniques)
- 8) 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, access to the facility may be revoked without the 2 warnings. This would be just cause for immediate expulsion.

5.7 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.

5.8 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.

6.0 Clean Room Protocols

6.1 Personal Hygiene

No make up, perfume, cologne, aftershave, or scented lotions should be worn in the clean room. Users must not smoke for at least four hours prior to entering the facility. If it is discovered that you have violated these guidelines you will be asked to leave until you have corrected the problem.

6.2 Footwear

Only flat soled closed toe footwear is allowed in any part of the NanoFab. Shoe covers must be worn at all times and are located at the NanoFab entrance.

6.3 Safety Glasses

Safety glasses are required at all times in the clean room area. They must be worn whenever any chemicals are being used or when any processes involving chemicals are being performed. They must also be worn when using any of the spinners or any other tool that may possibly have flying particles. They may be removed only when using the microscopes or when doing other close inspection type work but the safety glasses must remain with each user. Safety glasses are also required when working with chemicals in the 10k area.

6.4 Personal Listening Devices

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

7.0 Other Policies

7.1 Storage in the facility

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 Melissa Hawrelechko.

1. Storage boxes will only be assigned to registered local active NanoFab users. Possessing/occupying more than one storage box will not be permitted.
2. The NanoFab reserves the right to restrict the total number of individual storage boxes per group (academic or industrial).
3. The users name and group/supervisor will be marked on the storage box. It is the responsibility of the user to keep the information regarding ownership up-to-date with the NanoFab.
4. A \$20 refundable/transferable storage box deposit is required to obtain a storage box.
5. External users of the NanoFab will be provided at no charge, a common use storage box for their on-site work. 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.
6. Inactive NanoFab users cannot have assigned storage boxes. If a box belongs to an inactive user an email will be sent requesting removal of contents or transfer of ownership.
7. Users (active or inactive) receiving an email from NanoFab staff requesting action on their storage box will have 30 days to comply. Failure to comply will result in forfeit of storage box deposit.
8. Absolutely no chemical storage is allowed in storage boxes. The NanoFab provides a variety of safe chemical storage options for clearly labeled chemicals.

9. 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.
10. Regular audits of storage box use and adherence to the ***Storage Box Policy*** will be done.
11. This policy will take effect October 1, 2010 and will be reviewed on a yearly basis. Notification of these changes will be implemented through postings on the NanoFab website and through a policy change notification email to the NanoFab community.

7.2 Lost and 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.

7.3 Equipment and Tools

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

- Any malfunction of the equipment must be reported immediately to the NanoFab staff. Fill in a maintenance request form and deliver it to Keith Franklin's office or use our on-line maintenance request at:

[Maintenance Concern Form](#)

- All logbooks must be filled in every time you use the piece of equipment.
- Fixing or altering 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.

Standard operating procedures for each piece of equipment are posted on-line at:

[Resource Library - Standard Operating Procedures](#)

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

7.4 Tours

The NanoFab welcomes tours of its facility by any group. Tours do not need to be prearranged with the facility; the user or tour guide can simply bring the tour groups to the facility. We have found that tours are difficult for groups larger than 15 people. If you want to tour the outside of the facility (i.e. in the hallway) no special precautions are required. However, if you want to enter the non clean room (10K area) portion of the facility, all members of the group must put on shoe covers and the tour guides must be familiar with the facility and ensure the members of the tour group do not touch anything. Cleanroom access is only allowable with permission from NanoFab staff and by completing a “Visitor Access Form”.

7.5 Website

The NanoFab web site contains significant information that is useful to the NanoFab user community. The web site

www.nanofab.ualberta.ca

gives access to:

- All required forms to use the facility
- Optical mask processing authorizations forms
- Access to the booking system/scheduler
- The status of process tools (updated daily)
- Process recipes

7.6 Billing and Booking System

The NanoFab has a computerized billing system to allow for the accurate invoicing of research groups for their use of the facility. When a user begins using a piece of equipment, they must log into the system 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 login/billing 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 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 be booked through the scheduler located on the website:

<http://www.nanofab.ualberta.ca/booking>

- Users who book equipment have priority over users who just show up.
- If a user is more than 15 minutes late for a booking without notifying staff they may lose their scheduled time slot.
- Bookings can be canceled by contacting one of the NanoFab members.
- You must finish your process in a timely manner as to not run into someone else's time that they have booked.
- Users must log into equipment that they are using. It is the users responsibility to log themselves out at the end of their process.
- 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.

7.7 PVD Deposition Material Policy

As a convenience to our user community, the NanoFab supplies many materials for magnetron sputtering and electron beam evaporation. A list of these materials and thickness limitations can be found on the next page. 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 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.

Magnetron Sputtering

<u>Material</u>		<u>Maximum Thickness (nm)</u>
Aluminum	Al	1000
Aluminum Copper	Al/Cu	1000
Chromium	Cr	500
Cobalt	Co	500
Copper	Cu	1000
Gold	Au	500
Indium Tin Oxide	ITO	400
Molybdenum	Mo	500
Nickel	Ni	500
Nickel Chrome	NiCr	500
Niobium	Nb	400
Permalloy	Ni/Fe/Mo/Mn	400
Platinum	Pt	500
Silicon (undoped)	Si	400
Silicon (boron doped)	Si (doped)	400
Silver	Ag	500
Tantalum	Ta	500
Titanium	Ti	500
Titanium Tungsten	TiW	500
Tungsten	W	500

Electron Beam Evaporation

<u>Material</u>		<u>Maximum Thickness (nm)</u>
Aluminum	Al	500
Chromium	Cr	500
Cobalt(**)	Co	200
Gold	Au	100 (*)
Nickel	Ni	200
Palladium(**)	Pd	100 (*)
Permalloy(**)	Ni/Fe/Mo/Mn	200
Platinum	Pt	100 (*)
Silver(**)	Ag	250
Titanium	Ti	250
Aluminum Oxide(**)	Al ₂ O ₃	250
Silicon Dioxide(**)	SiO ₂	250

(*)- 50 nm limit during training
(**)- Gomez Only
Based on >85% tooling rate on CTM

Known Prohibited Materials (*)

Carbon	C
Lead	Pb
Magnesium	Mg
Selenium	Se
Zinc	Zn
Tin	Sn
Indium	In
Cadmium	Cd

(*)- Any material not listed must be approved via Chemical Import or Project Proposal documents

Appendix A

Emergency Telephone Numbers

- FIRE 911
- CAMPUS SECURITY 2-5050

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

Appendix B

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.

Appendix C

Equipment Problems

During Regular NanoFab Hours:

If the problem is major:

- Contact a NanoFab staff member
- If there is no chance of personal injury – attempt to contain the problem

If the problem is minor:

- Place a “Down” sign on the equipment if required
- Fill out a Maintenance Request Form and drop it off in room W1-051 or W1-053 or fill one out on-line

During NanoFab Non staffed Hours:

If the problem is major:

- Emergency contact information for NanoFab staff is located in the Emergency binder located in gowning.
- If you are unable to contact staff phone: **2-5555**

If the problem is minor:

- Place a “Down” sign on the equipment if required
- Fill out an on-line Maintenance Request Form or a paper copy and drop it off at room W1-051 or W1-053

Appendix D

Equipment that can NOT be used after-hours

Any wet processing

Electroplating

Tystar LPCVD

Minibrute Furnaces

Lesker production sputter system (Count Floyd)

Appendix E
After-Hours processing policy
August 30, 2010

1. After-Hours processing is allowed at the discretion of the NanoFab staff members. Colleague status will not be granted automatically. To obtain After-hours access the user must:

- a) have User status on the tool(s) requested,
- b) the user must request Colleague status for each individual tool from their trainer(s),
- c) once Colleague status is given on a tool, the user must see Stephanie or Jolene and fill out an OneCard Access form.

In order to be approved by their trainer each user will have to present the MSDS sheets for any chemicals that they will be using in their processes and a detailed spill clean-up plan as to what they would do in the case of a spill during their process. In processes that do not require the use of chemicals the user will still have to describe to the trainer what the steps to be taken if a situation arises. These plans must be submitted by each individual user and must not be the same generic plan submitted by all members of a group or company. The trainer, Stephanie and Jolene will still reserve the option of not approving "Colleague" status to any user as they see fit.

2. No heating of chemicals is allowed.

3. Chemicals are only to be used in the Optical Lithography area, Fumehood Aisle 1 and Fumehood Aisle 3. Use of chemicals on the Wet Processing decks will not be allowed.

4. We allow the normal dispensing of After-Hours allowable chemicals provided that the user has met our "Colleague" status sign-off requirements.

After-Hours Allowable Chemicals:

IPA	HPR504
Acetone	HPR506
354 Developer	AZP4620
MF-319 Developer	KMPR
CD-26 Developer	SU-8
AZ 400K Developer	PMMA
MIBK/IPA Developer (various concentrations)	HSQ
SU-8 Developer	

5. A Safety Concerns Form must be completed and submitted to the Safety Committee if there ever is a chemical spill. This form must be completed even if the spill is minor and has been successfully cleaned up by the user.

6. The zero tolerance rule in regards to infractions and cleanliness will apply.

Appendix F

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.

1. International mask submissions will be allowed, as approved by the NanoFab committee February 2009, at the non-subsidized rate equal to the Industrial Rate.
2. The non-subsidized Industrial and International Rate is \$420 CDN (including processing). There will no longer be an option for only printing. This will ensure consistency of NanoFab optical masks produced.
3. The default mask writing time for all categories of masks will be changed from 2 hours to 2.5 hours followed by the standard per minute surcharge. This increased minimum writing time reflects increases in write times associated with longer and more reliable writes.
4. Default charges for subsidized Academic and Academic-Industrial masks will increase to \$185 and \$255, respectively. These price adjustments represent an increase of 9% associated with the increase in default writing time and consumable costs of blank masks and mask holders.
5. Shipping charges will now be 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 on-line submission process. Masks requiring shipment without a Courier Account Number will be invoiced \$150 CDN for shipping.
6. A \$25 handling surcharge will be applied to masks requiring shipping. This fee covers the cost of packaging and administrative overhead.
7. These changes will take effect September 1, 2010, which is the beginning of a new quarterly billing cycle. Notification of these changes will be implemented through postings on the NanoFab website and through a policy change notification update during the mask submission process.

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

Appendix G

NanoFab Billing Policy

Re: Billing Policy – Sept. 24, 2010

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 Melissa Hawrelechko.

1. NanoFab invoices are generated on a quarterly basis the first day of September, December, March and June. 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 academic, academic-industrial, or industrial rate schedules. These schedules are applied to the project at the time of their creation.
4. Invoices submitted to University of Alberta PIs can be paid by internal speed code through completion of a U of A Indent form.
5. Invoices submitted to external PIs are administered by the University of Alberta Financial Services and are subject to a University of Alberta 15% 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 Melissa Hawrelechko.

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