COVID-19 PRISM Cleanroom Facility User Protocol

The PRISM Cleanroom consists of two floors of main Cleanroom laboratory space, a Soft Materials Processing (SMP) laboratory and Packaging laboratory. These labs will be gradually returning to full operation in a phased manner beginning with experienced Labmembers (who have after-hours access) and followed by all previously trained internal Labmembers (except undergraduate students and industrial collaborators).

The start and duration of each phase will be determined by PRISM and School of Engineering and Applied Science (SEAS) and announced to Labmembers via e-mail and NEMO, at which time a determination will be made as to training and allowance for others to enter the Cleanroom.

In alignment with Princeton University guidelines, the Princeton Institute for the Science and Technology (PRISM) Cleanroom facility is planning to implement new forms of hygiene, social distancing and other COVID-19 precautions to provide a safe work environment for all personnel. New rules can be found on the PRISM Cleanroom website. Check back for changes and modifications as alerted by NEMO and email. The following steps must be taken to qualify for re-entering the Cleanroom:

- As an EHS requirement, prior to coming to the PRISM Cleanroom (Cleanroom, SMP and Packaging laboratories) you must:
  2. Complete Risk Assessment Questionnaire that needs to be reviewed by UHS.
  3. Download TigerSafe App symptom checker (http://emergency.princeton.edu/stay-connected/tigersafe) and use it before coming in daily.

- Complete PRISM Cleanroom online training that is currently in preparation stage and will be posted and announced soon.

- Sign and email back to Joe Palmer (jpalmer@Princeton.edu) a new PRISM Cleanroom Expectations for Use document indicating you understand and will follow new PRISM Cleanroom rules (see document below).

- Protect yourself and others at all times when in the PRISM Cleanroom by maintaining safe social distancing, covering your mouth and nose with a face mask, double gloving when inside the laboratory, and rigorously practicing cleanliness (hand-washing/sanitizing, disinfecting surfaces after each use).

- If you feel an environment is not safe for you and if someone is putting you at risk, such as by ignoring social distancing or face covering, communicate with the individual, contact PRISM Cleanroom Staff (via phone or e-mail) or send a report confidentially via the EthicsPoint: https://secure.ethicspoint.com/domain/media/en/gui/27291/index.html.

Review NEW Buddy System policies listed below and follow at all times when doing research in the Cleanroom, SMP and Packaging laboratories.
Access to the Facility

PRISM Cleanroom access will be active only for authorized users who will complete PRISM Cleanroom online training and get familiar with new procedures. All Labmembers will be informed about PRISM Cleanroom training requirement and its schedule by email. All returning Researchers will have to sign and e-mail back to Joe Palmer (jpalmer@princeton.edu) a new PRISM Cleanroom Expectations for Use document indicating they understand and will follow new PRISM Cleanroom rules (see document attached below).

User access to the main Cleanroom, SMP and Packaging laboratories will, in the first two opening phases, only be available 24/7 to experienced Labmembers, authorized for after-hours access and able to work independently and Monday - Friday 8 a.m. – 5 p.m. to all other previously trained internal Labmembers (except undergraduate students and external collaborators). Return to normal operations will be determined by the University’s leadership allowing all Labmembers including undergraduate students and industrial collaborators to return to full operations.

Distancing Protocols

To ensure the required six foot social distance, the occupancy of the PRISM Cleanroom will be limited. Based on the University guidance for the use of 160 ft\(^2\) per researcher, the number of people in the main Cleanroom laboratory will be restricted to 25 (15 in upper and 10 in lower cleanroom) and posted on the door. Users can check the status board with occupancy on a monitor in front of the main entrance or NEMO App. Maximum 1 User per tool/hood and maximum 2 Users per bay will be allowed inside the main Cleanroom. Only one person can be inside E-Beam-1 room, due to its size. Maximum 2 users are allowed inside the SMP and Packaging laboratories (maximum 1 User per tool or hood). Furthermore, only one person can be in pre-gowning and gowning rooms. Stage at the wipedown station outside the hallway entrance. Follow the occupancy restriction and distancing signage posted on the entrance doors and walls inside the facility.

The Staff-User interactions will be mostly remote and focused on e-mail, phone, text, and conference calls. Online training showing how to enter the facility and explaining the new rules will be announced by e-mail and then presented for Labmembers. Orientation lecture with quizzes will be in online form using Canvas, the Learning Management platform. Later, TBA, in-person tool training and orientation tours for new Labmembers will re-commence, in one-on-one formats.

Hygiene Protocols to Minimize Risk of Infection

PRISM Cleanroom Staff followed Princeton University recommendations and set procedures that must be taken before coming to and when inside the facility to help prevent the spread of COVID-19 disease. Therefore it is required to use the TigerSafe Symptom Tracker before entering the Cleanroom. Surgical face covers are required at all times when in the PRISM Cleanroom. Beard covers are insufficient. Wait until you exit the cleanroom to remove your surgical mask.

COVID-19 may also be transmitted when people touch contaminated surfaces and then touch their face, nose or mouth. Therefore, before coming to the facility, wash hands for at least 20 seconds with soap. Then, clean hands with provided sanitizers in front of or when in pre-gowning rooms. Double glove when inside the laboratories. Furthermore, clean and disinfect items brought to the cleanroom, surfaces you have touched and face shields or microscope eyepieces with provided 70% IPA solution and wipes.
**Procedures for entering and using the pre-gowning areas**

To get to the main Cleanroom, Labmembers will enter only through the upper level entrance. SMP laboratory will be entered only through the lower level entrance. In both cases, Labmembers pass through pre-gowning and gowning areas and follow new gowning protocols listed below.

- Wash hands before coming to laboratory (wash your hands with soap and water for at least 20 seconds).
- Use sanitizing hand gel located at the hallway entrance to the pre-gowning area.
- Use the TexWipes and 70% IPA solution to wipe all the items that you brought in and will be taking into the cleanroom with wipes wetted with 70% IPA solution (wipes and 70% IPA solution provided on the bench next to the door).
- Look through the window and wait outside (in the hallway, next to the wiping station) until it is dark inside the pre-gowning room and it is your turn to enter. Maximum one person will be allowed in pre-gowning area. Therefore, quickly proceed through each space in pre-gowning room to avoid congestion. Thank you for your patience as you wait for your turn.
- Open the main door without using hands. Use TexWipe that you wiped down items with or another one located on the wiping station located in front of the door.
- If you wear a face cover (any type) when coming to the pre-gowning room, you must remove and replace it. Remove the mask from behind (do not touch the front of mask). If you wear a disposable face mask place it into the garbage can. Cloth face mask can be stored in a ziplock bag provided by cleanroom staff. After removing the mask and before placing a new one, clean hands with hand sanitizer.
- Put on a surgical face mask provided by PRISM Cleanroom over your mouth and nose. (The use of beard-covers without the use of a close-fitting surgical face mask will not permitted).
- Put on booties.
- Place backpack and all items that you do not need inside the locker.
- Place the hair net.
- Don gloves. When donning, touch only the cuff of your glove and do not touch the finger area of your glove to avoid covering them with contamination.
- When entering the gowning room you are always required to wear surgical face mask, hair net, booties and clean nitrile gloves.
- When leaving the facility, in pre-gowning room,
  - take your items from the cabinet,
  - wipe the locker handle with wipes wetted with 70% IPA solution.
- Gloves, hairnet and face mask will be disposed after leaving the pre-gowning room to the hall.
- Remember to put on your personal face covering.

**Procedures for entering and using the gowning rooms**

- Only one person at-a-time is allowed in the gowning room. There is a motion detector inside the gowning room that goes off after 1 minute of no motion. Wait outside the gowning area until it is dark inside the gowning room and it is your turn.
- In the gowning room, log in to the area on login station.
- In the gowning room for the main Cleanroom, start gowning from the top-down manner. First, put the hood on. Then, put the cleanroom coverall and boots. Next step prior to entering the Cleanroom is double gloving.
• In the gowning room for SMP, put on a frock and second pair of gloves. (Only two people at-a-time are allowed in the SMP, so verify through the window and NEMO before entering the area)
• In gowning rooms, you are required to put on eye protection that you must wear at all times when inside the laboratory. You will receive your own safety glasses and splash goggles. If you lose glasses or goggles, contact Staff and request new eyewear. Anti-fog splash goggles are available through the PRISM Cleanroom stockroom.

Each Cleanroom Labmember will have assigned a plastic bin for storing cleanroom garments, safety glasses, goggles and ID badge. In the SMP lower gowning room, frocks will be stored on the hangers spaced far enough not to touch each other. Once a week users should change their garments (or frock) and place the used ones in the hamper.

**Procedures for the main Cleanroom and SMP laboratories**

• Always wear double gloves when in the Cleanroom and SMP laboratories. Discharge contaminated gloves and replace with the clean ones as necessary. Avoid touching exposed skin areas, if you do, replace gloves immediately with clean gloves.
• After finishing work, return all supplies, chemicals, and glassware to its proper place of storage within the laboratory, clean up after yourself and wipe down the surfaces using provided 70% IPA solution and TexWipes.
• Before and after each use, wipe down face shield and microscope eyepieces using provided 70% IPA solution and TexWipes.

**Procedures for entering and using Packaging laboratory**

• Wash hands before coming to laboratory (wash your hands with soap and water for at least 20 seconds).
• Use sanitizing hand gel located at the entrance to the Packaging laboratory.
• Use the TexWipes and 70% IPA solution to wipe all the items that you brought in and will be taking into the laboratory with wipes wetted with 70% IPA solution (wipes and 70% IPA solution provided on the bench next to the door).
• Look through the window and also check NEMO Status Dashboard before entering the area, because maximum two users are allowed to be in Packaging laboratory.
• Open front door with available TexWipe.
• Wear face cover.
  • If you wear your own face cover, you do not have to replace it. But if not, put on a face mask provided by Staff in dispenser over your mouth and nose.
• Wash hands when inside the laboratory and when handling a face mask (sink, soap TexWipes are inside).
• Don gloves (glove boxes located on a rack with common supplies, next to the fume hoods).
• Then log in to the area on login station. Do not touch the screen on a login station without the gloves.
• Wear face cover and gloves at all times when in packaging laboratory.
• ESD aprons and wristbands are User-optional but can no longer be shared – these are available for sale at the stockroom.
• Before and after each use, wipe down microscope eyepieces and face shield using 70% IPA and TexWipes.
• Before leaving the laboratory, return all tools and supplies, and to their proper place of storage within the packaging laboratory, clean up after yourself and wipe down the surfaces using provided 70% IPA solution and TexWipes.

For processes at fume hoods and lapping/polishing station, Users must wear a proper personal protection equipment such as single use frock (located on rack with common supplies), double nitrile gloves and eyewear that is located in a dispenser. This is a minimum required PPE for work at the stainless steel fume hoods and lapping/polishing stations in packaging room. We strongly recommend wearing additional PPE such as chemical resistant apron on top of the frock when doing work with toxic substance such as TCE. When finished working, at the hoods or lapping/polishing station and before moving on to any other function, User is required to remove top pair of gloves, wipe a face shield, place eyewear in used bin, and place frock in the hamper.

Buddy System for PRISM Cleanroom

All research operations in the PRISM Cleanroom require a Safety Buddy. Operations at the fume hoods and furnaces (see Appendix A for details) require an in-person Safety Buddy. All other operations in the main PRISM Cleanroom must be performed either with the assistance of an in-person or a virtual Safety Buddy.

Safety Buddies—Key Points:
1) Safety Buddies feel responsible to one another, checking on each other at regular intervals and taking care to communicate when one needs to leave the Cleanroom.
2) Lab researchers are responsible for identifying and coordinating with their own Safety Buddies. No one is obligated to remain in the lab as a Safety Buddy; but under low occupancy conditions, they are obligated to notify others when they are leaving. The researcher must also leave at that time if they cannot identify another in-lab or virtual Safety Buddy.

When an in-person Safety Buddy is required
In the PRISM Cleanroom, SMP and Packaging laboratories, those who transport liquid chemicals to/from chemical cabinets or perform wet chemistry operations at the fume hoods or conduct research at furnaces (see list below with all wet benches, fume hoods and furnaces) cannot be alone and must have an in-person Safety Buddy present: at least one Staff or other authorized Labmember in the same laboratory level (line of sight or within hearing distance) at all times. In other parts of the PRISM Cleanroom, Labmembers may work with a virtual Safety Buddy.

All Labmembers may serve as in-person buddies during regular business-hours (M-F, 8 a.m. – 5 p.m.) and after-hours (M-F 5 p.m. – 8 a.m., weekends and holidays), but only approved Labmembers will be allowed to use tools and processes after-hours. If you are not authorized to use tools after-hours, please contact Joe Palmer (jpalmer@princeton.edu) for modified key access to serve as a buddy.

Virtual Safety Buddy
A Virtual Safety Buddy is a designated individual who has agreed to serve as a point of contact while you conduct research operations other than chemical operations at the fume hoods or work at the furnaces in the PRISM Cleanroom, SMP lab, or Packaging lab. A virtual buddy should be a currently active member of the PRISM Cleanroom or your PI, check in with you on a pre-
established, periodic basis (min. every 30 min) via phone call, text message, SLACK or TigerSafe WorkAlone App, and contact Public Safety immediately in the event of an emergency or if a scheduled check-in is missed and you cannot be reached. Therefore, each Labmember should install TigerSafe App on their electronic device (e.g. phone or tablet) and use the WorkAlone feature (https://emergency.princeton.edu/WorkAlone) to coordinate periodic checks with your remote buddy when you expect to be alone in the laboratory. As a reminder, virtual buddy is not adequate for supporting wet chemical operations or work at the furnaces. In those instances, an in-person buddy is required.

**Communication—in the Spirit of the Policy**

There are many hazardous activities that place you and others at risk. Beyond extensive training, policies, practices and your best judgement, it is still in your best interest and that of others to locate an in-person Safety Buddy. Whether virtual or in-person, you must communicate with your Safety Buddy and understand each other’s schedule to ensure no one is left alone. If you cannot find an in-person buddy, coordinate your time with a virtual buddy via TigerSafe App. If you plan to work after-hours, please take the time to coordinate your work schedule with another after-hours authorized Labmember or have a virtual buddy check in on you. Remember that work at the fume hoods and furnaces always requires an in-person Safety Buddy. Below find some tools to help you coordinate your work with other Labmembers.

**No fees for those serving as buddies and not doing lab work**

If you are serving as a Safety Buddy and not doing any other work in the laboratory, you won’t be charged; but you still must log in to the area by selecting the “BUDDY” project on the NEMO login station.

**It is your responsibility to identify your own Safety Buddy**

Please plan ahead. It is your responsibility to find a buddy before coming to the laboratory. You can do it using a Slack channel, NEMO Labmember Directory or Buddy Calendar on NEMO Equipment Management and Operations website.

**Buddy System Tools**

**Buddy Calendar on NEMO**

The NEMO buddy calendar can be accessed at https://nemo.princeton.edu/calendar/, and click “Buddy View” to display all upcoming reservations. Then, click on reservations and coordinate your time with other Labmembers.

**Labmember Directory**

On NEMO, there is also Labmember Directory page that contains a list of all active PRISM Cleanroom Labmembers: https://nemo.princeton.edu/directory/ and all those Labmembers may serve as after-hours safety buddies upon request (Contact Joe Palmer: jpalmer@princeton.edu for modified key access to serve as a buddy). You may email a Labmember by clicking on that person’s name and coordinate your time in the laboratory. If no one can accompany you and you cannot find a buddy, do not proceed with the work.

**TigerSafe WorkAlone App**

Each PRISM Cleanroom Labmember should install TigerSafe WorkAlone App on their phone and configure it when working alone in the laboratory in such a way that the App is in contact with the
remote buddy’s phone. Then, the App requires the individual working alone to regularly acknowledge a check-in alarm generated by TigerSafe. If the person fails to acknowledge the alarm, TigerSafe immediately notifies the safety buddy who can then contact the researcher or notify the Department of Public Safety. For more information about the TigerSafe WorkAlone App please visit: http://emergency.princeton.edu/WorkAlone.

*Visual and Audible Notifications*

NEMO will alert you that there are three or fewer Labmembers available to serve as Safety Buddies in the following instances:

- when you reserve a tool and others have not yet subscribed to the same time period in the lab
- when you log in to the gowning room NEMO station and there are two or less others in the lab
- when you log out of the gowning room and there are two or less individuals still logged in
- The PA system will make periodic automated announcements when three or fewer individuals are logged into the lab.
PRISM Cleanroom Expectations for Use

Expectations Related to COVID-19

Princeton University expects that all researchers will perform COVID-19 Risk Self-Assessment and self-report symptoms every day prior to coming to campus using the self-screening TigerSafe Symptom Tracker App. Stay home when you feel sick, but also:

- Wash your hands before coming to the PRISM Cleanroom Facility for at least 20 seconds.
- Practice social distancing by putting 6 ft. (2 meters) space between yourself and others.
- Wear a surgical face cover (beard covers are insufficient).
- Clean and disinfect surfaces (e.g., eyepieces) and PPE (e.g., face masks or aprons) with provided 70% IPA solution and wipes.

What you can expect from the Cleanroom Staff

- Courtesy – We are all continuously learning. We love to learn about your research and new ways of doing things as much as we love to share what we know.
- Safe systems – We commit to a safe, productive working environment with functioning infrastructure and systems
- Tools to get the job done – You have access to supplies, tool status, process performance trends, operating procedures, quick start guide, lab user manual, accessible and friendly staff...

What others expect from you

- A Safe Attitude - people who place themselves and others at risk will lose lab access privileges.

  All operations must be undertaken with primary consideration for the safety of both the individual and others in the community. Working unimpaired (e.g., impairments due to lack of sleep, overstress, illness, medicated or intoxicated) is as important in the lab as it is in driving a vehicle. Ignorance of the procedures and protocols, lack of common sense, carelessness, and haste do not excuse unsafe behavior.

- Respect for Others– Do you understand the purpose of the Buddy System and do you adhere to the spirit of that purpose? Do you clean up after yourself? Are you courteous and respectful of the facility and the people who work and perform research here? Is this a better place for everyone because you are here?

  Tool users must not change common tool recipes, leave vacuum chambers vented, process materials beyond the posted “allowed” set, or leave the tool in a non-baseline state. Tool users should reserve equipment time judiciously. All chemical containers must be labeled. Unattended chemical containers must be labeled with the name of the owner, contact information, time/date left and time/date to return.

Things that are up to you:

- Your Process and Research – It is your responsibility to run monitor wafers and appropriate test structures to ensure your processes perform as you expect them to.
- Your Responsibility – If you see a problem, please communicate with the individual or report it to the lab staff.
- Your Accountability – If you create a problem, it is far better to “own-up” to it immediately.
- Your Honor – The facility operates on the honor system - violations will be handled appropriately.
What you can expect as an outcome of working at the PRISM Cleanroom

Pride of ownership results from your respectful use of the lab. A rewarding, satisfying sense of community comes from interacting and working well with others in the lab. Research success comes from appreciating and utilizing the available resources to full effect.

Some Specifics

• Log in and out of NEMO when entering and exiting the PRISM Cleanroom facility EXCEPT when leaving in an emergency so that first responders can account for all those who were in the facility.
• Replace the launderable suits as often as you see fit. The storage racks will be emptied on a one-week basis.
• Safety eyewear is required at all time when in the Cleanroom and SMP. Choose safety glasses or splash goggles then wear them consistently without swapping during the day. Don’t handle eyewear with chemical gloves.
• Splash goggles or face shield on top of safety glasses to be worn when working at any chemical hood in main Cleanroom, SMP and Packaging laboratories.

Restricted Equipment & Use of Lab

• All research operations in the PRISM Cleanroom require a Safety Buddy.
• Operations at the chemical hoods (acid, solvent, spin, develop, etc.) and furnaces require an in-person Safety Buddy.
• All other operations in the main PRISM Cleanroom must be performed either with the assistance of an in-person or a virtual Safety Buddy.

Bringing Chemicals into the PRISM Cleanroom

In order to be allowed to bring new materials (substrates or chemicals) into the PRISM Cleanroom:

• Fill out the New Material Request form in NEMO.
• Refrigerated chemicals cannot be stored in either refrigerator until approved by Cleanroom staff.
• The chemicals must be stored in the appropriate cabinets, on shelves designated for your use.
• All chemicals MUST have a PRISM Cleanroom staff provided label (filled out) on it.
• Chemicals not managed according to these instructions will be disposed as waste.

Guests

All guests must be cleared by the PRISM Cleanroom Staff before entering the cleanroom. Guests are admitted to the cleanroom for the purposes of a tour or observation only; no guests are allowed to process devices or use equipment.

No entitlement to work in the PRISM Cleanroom

• It is a privilege to work in the PRISM cleanroom. No one is entitled. Everything you do inside the lab affects others.
• There are no police in the Cleanroom. It is your responsibility to communicate directly with others in the Cleanroom. Be adults: communicate with each other and work out issues together. If you see a problem, report it to Cleanroom staff.
• Individuals who demonstrate the inability to work unsupervised will be denied after-hours access to the Cleanroom: not following hygiene, face covering, and self-distancing procedures, not cleaning up after themselves, not exhibiting awareness or respect for fellow Labmembers.
• Safety violations will result in loss of access. Honor system violations will result in loss of subsidy.

I understand and agree to the above conditions of use: Signed ____________________________ Date ____________________

Printed Name_________________________________, PI Signature ____________________________ Date____________________
Appendix A
List of fume hoods and furnaces in PRISM Cleanroom labs that require an in-person Safety Buddy.

Fume Hoods:
- RCA Hood, room 176
- Acid Hood, room 184
- Base Hood, room 184
- Wet Solvents Hood, room 184
- Wet Stripping Hood, room 184
- Photo-Develop Hood, room 180
- Nano-Litho-EBL Hood, room 054
- Nano Process Hood, room 054
- Photo-SU8 Process Hood, room 180
- Photo-Spin Coat Hood, room 180
- SMP Hood-1, room 065
- SMP Hood-2 room 065
- Packaging Lab Solvent Hood, room 073
- Packaging Lab Lapping Hood, room 073
- Automatic Develop Stations, rooms: 180, 054
- Polos Chrome Etch Processor, room 054

Furnaces:
- CVD 2-stack annealing furnace, room 176
- CVD Equipment 1033 LPCVD and oxidation furnaces, room 176
- CVD Equipment 1034 APCVD oxidation, annealing and diffusion furnaces, room 176