

Cleanroom Protocol

Version 1.4

5/26/2022

MIT.nano Cleanroom Access, Maintenance, and Minor Construction Protocol

Purpose - The MIT.nano cleanroom is intended to provide a controlled environment with a low level of foreign material such as dust, airborne microbes, aerosol particles, and chemical vapors. The cleanroom is also designed to maintain strict specifications in regard to other environmental parameters such as temperature, humidity and pressure. These strict environmental controls are intended to mitigate the risk of compromising sensitive research and fabrication processes within the space.

The procedures outlined in this document are intended to allow execution of required maintenance tasks and minor construction activities within the cleanroom while minimizing the risk of compromising the environmental specifications.

COVID-19 Addendum – The following additional protocols have been added in light of the 2020 Pandemic:

- All personnel must meet and adhere to COVID-related protocols and procedures defined by the State of Massachusetts, the City of Cambridge, MIT, and MIT.nano.
- Personnel are encouraged to bring and use their own safety glasses. Shared safety glasses are still available, but personnel should disinfect these with 70% isopropanol before and after use.

1. Scope

- 1.1. For the purpose of this document, the “cleanroom” shall include all bays, chases, fan-decks, wipe-down areas, gowning areas, and Privately Managed Lab Spaces under HEPA on levels 1 through 4, and the north side of level 5 of the MIT.nano facility.
- 1.2. The cleanroom is divided into three different standards
 - 1.2.1. Bays: Class-100 – No more than 100 particles equal to or greater than 0.5 micron per cubic foot of air.
 - 1.2.2. Chase, Fan Deck, Lab Spaces: ~Class-1000 – No more than 1000 particles equal to or greater than 0.5 micron per cubic foot of air.
 - 1.2.3. Lab Spaces: ~Class-10,000 - No more than 10,000 particles equal to or greater than 0.5 micron per cubic foot of air.
- 1.3. All Personnel including Fab Staff, Fab Users, MIT Department of Facilities Personnel and Contracted Vendors must read and understand this protocol and participate in a brief training session on its content prior to being granted access to the cleanroom.
- 1.4. Trained personnel may escort untrained personnel into the cleanroom. The escort shall be responsible for ensuring this protocol is adhered to at all times.
- 1.5. Failure to adhere to this protocol may result in cleanroom access privileges being revoked or restricted without notice.

2. General

- 2.1. Food and drinks are not permitted inside the cleanroom at any time.

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- 2.2. For safety, personnel should wear long pants and shoes should have enclosed toes (no flip-flops or open-toe sandals). Clothing and shoes must be generally clean and free from dust and frayed fabric.
 - 2.3. For safety, ear buds and headphones are not allowed so that personnel maintain awareness of alarms and surroundings.
 - 2.4. No materials with the potential to release particulates into the cleanroom airstream are permitted inside the cleanroom. These include but are not limited to; all paper/cardboard products (specially designated cleanroom paper is permitted), wood, pencils, steel wool, chalk, exposed fiberglass, sandpaper, cloth/duct tape (cleanroom rated tape is permitted), aerosol sprays, and any similar items.
 - 2.4.1. Porous materials that can accumulate dirt are not allowed in the cleanroom, including leather belts and gloves.
 - 2.4.2. Some activities may require heavy-duty gloves for cut or abrasion resistance. In this case special cleanroom compatible gloves should be used.
 - 2.5. All activities/tasks that may produce dust, shavings, or other particles shall be performed outside the cleanroom whenever possible. These include but are not limited to; grinding, cutting, threading, sawing, drilling, welding, soldering, painting, and scraping.
 - 2.5.1. In rare cases performing these activities/tasks within the cleanroom is unavoidable. Personnel shall follow the requirements in Section 5 of this documents in these instances.
 - 2.6. Some commonly used maintenance products contain ingredients which may affect certain cleanroom processes. A product datasheet for all products intended to be used within the cleanroom must be submitted to the cleanroom manager for approval prior to use. This includes any lubricants, solvents, paint, cleaning products, etc.
 - 2.7. Personnel entering the cleanroom may not wear makeup, perfume, cologne, hair spray/gel, body lotion, and similar products. These products have the potential to dissipate particulate matter, stain garments, or otherwise compromise the integrity of the cleanroom.
 - 2.7.1. Smoking generates particles. Personnel should avoid smoking while working in the MIT.nano facility, or they should gargle with water prior to entering the cleanroom.
 - 2.8. Personnel gowned in full coverall (for Class-100) may travel between Class-100 and Class-1000 Cleanroom Space, though this movement should be minimized. The intent is to facilitate maintenance of cleanroom process equipment.
 - 2.9. Travel from Class-1000 (Chase) to Class-100 (Bay) is not permitted without following gowning procedures for Class-100 Cleanroom Space.
 - 2.10. Permanently installed ladders are available between levels 1 and 2, and Levels 3 and 4. These ladders are intended for emergency use only. Exceptions for use during testing or other maintenance/construction activities may be permitted with prior approval from the Assistant Director of Infrastructure, currently Nick Menounos (menounos@mit.edu).
- 3. Entering Class-100 Cleanroom Space**
- 3.1. All Gowning for Class -100 Cleanroom Space will take place in the Primary Pre-Gown/Final Gowning rooms on Level 3 (Room 3101/3015).
 - 3.2. Personnel shall walk over tacky mat to remove excess dirt from shoes each time they enter the gowning area.
 - 3.3. All materials, tools, parts, etc. entering the cleanroom must be cleaned with a solution specified by the cleanroom manager.

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3.4. Gowning for entry to Class-100 Cleanroom Space shall be in the following order:

3.4.1. Pre-Gown Area

- A. Disposable Shoe Covers (swing legs over bench)
- B. Safety Glasses
- C. Bouffant Cap: all hair contained under bouffant
- D. Vinyl Gloves

3.4.2. Final Gowning Area

- A. Hood: fastened with all hair contained, and covering your nose and mouth
 - a. Personal face coverings may be removed and stored in your pocket while wearing the cleanroom hood.
- B. Coverall: hood tucked in and fully fastened
- C. Secondary shoe covers.
- D. Affix your name badge or visitor badge to the coverall.
- E. Enter Class-100 Cleanroom Space through the designated door.
- F. Nitrile Gloves (over vinyl gloves, just inside Cleanroom door)

3.5. De-gowning when leaving the Cleanroom

3.5.1. Final Gowning Area

- A. Recycle uncontaminated nitrile gloves before re-entering Final Gowning
- B. Remove secondary shoe covers (swing legs over bench, shoe covers should not touch the "dirty" floor), hang on Garment Rack
- C. Remove Coverall, hang on Garment Rack
- D. Remove Hood, snap to Coverall on Garment Rack, affix name badge to the hanger
- E. Leave Final Gowning

3.5.2. Pre-Gown Area

- A. Remove disposable shoe covers (swing legs over bench)
- B. Dispose of bouffant cap, shoe covers and gloves
- C. Exit Pre-Gown area

4. Entering Class-1000 or Class-10,000 Cleanroom Space

4.1. Personnel Gowning and Entry for Class-1000 or Class-10,000 Cleanroom Space will take place in the following acceptable locations:

4.1.1. Level 1: Tool Wipe-Down (Room 1161)

4.1.2. Level 2: Service Gowning Area (Room 2167)

4.1.3. Level 3: Primary Pre-Gown/Final Gowning Area (Rooms 3101/3015)

- 4.1.3.1. There is a separate entrance to Class-1000 and Class-10,000 Cleanroom Space when exiting the Final Gowning Area

4.1.4. Level 4: Service Gowning Area (Room 4165)

4.2. Personnel shall walk over tacky mat to remove excess dirt every time they enter a wipe-down or gowning area.

4.3. All materials, tools, parts, etc. entering the cleanroom must be cleaned with a solution specified by the cleanroom manager.

4.4. Tool Move-In and Equipment Wipe-Down will take place in the following acceptable locations:

4.4.1. Level 1: Tool Wipe-Down (Room 1161)

4.4.2. Level 3: Tool Wipe-Down (Room 3160)

4.4.3. Tool Move-In procedures are detailed in a separate document

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- 4.4.4. The outer door and inner door to the Wipe-Down areas shall not be opened at the same time.
- 4.5. Gowning for entry to Class-1000 and Class-10,000 Cleanroom Spaces shall be in the following order:
- A. Disposable Shoe Covers
 - B. Safety Glasses
 - C. Bouffant Cap (Assure all hair is entrained under bouffant)
 - D. Vinyl/Nitrile Gloves
 - E. Frock (must be fully fastened)
 - F. Affix your name badge or a visitor badge to the frock
 - G. Hard hat/bump cap (for Personnel entering fan-deck space on Level 2 or Level 4)
- 4.6. De-gowning when leaving Cleanroom Space
- A. Remove Hard Hat and Frock, place on hanger
 - B. Recycle shoe covers in the bin if they are in good condition.
 - C. Dispose of bouffant and gloves
- 5. Maintaining Cleanroom Integrity**
- 5.1. Performing tasks that risk the integrity of the cleanroom (grinding, cutting, threading, sawing, drilling, welding, soldering, painting, scraping, vibration, heat generating, etc.) should be completed outside the cleanroom whenever possible.
- 5.2. Any task that must be completed inside the cleanroom, that may jeopardize the cleanroom integrity, must be approved by the Assistant Director of Operations, currently Kris Payer (kpayer@mit.edu) prior to starting the work.
- 5.2.1. A work plan must be submitted to the Assistant Director of Operations including the following information:
- 1. Summary of work
 - 2. Justification – why must this be done inside the cleanroom
 - 3. Risk being generated - particles, vibration, heat, etc.
 - 4. Specific area of work
 - 5. The schedule of work (date, time, duration)
 - 6. Mitigation Plan – HEPA vacuum, temporary barriers, etc.
- 5.2.2. The Assistant Director of Operations, at his/her discretion may re-classify an area temporarily as a mitigation strategy.
- 5.2.3. The Assistant Director of Operations must be notified prior to the start of work and at the conclusion of work.
- 5.3. Failure to maintain the cleanroom integrity has the potential to compromise active research and puts at risk years of effort, capital, and future funding.