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Cleanroom Protocol Requirements

REVISION

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1. PURPOSE AND SCOPE

1.1 Purpose

The purpose of this document is to define the general cleanroom protocol requirements for the wafer processing areas. This procedure describes applicable cleanroom class criteria, gowning practices, appropriate behaviors, donning and doffing steps, specific cleanroom pathways, and cleanroom environmental controls.

1.2 Scope

These requirements apply to all NY CREATES employees, foundation partners, subcontractors, and guests who enter the cleanrooms at NY CREATES' NanoFabs: NanoFab North (NFN), NanoFab Central (NFC), NanoFab South (NFS), NanoFab South Extension (NFSX), NanoFab Xtension (NFX), and META Center, which are located at the Albany NanoTech Complex.

2. DEFINITIONS

2.1 **EHS** – Environmental, Health, and Safety

2.2 **FOUP** – Front Opening Unified Pod; standard wafer carrier

2.3 **META Center** – Material Engineering Technology Accelerator

2.4 **NFC** – NanoFab Central

2.5 **NFN** – NanoFab North

2.6 **NFS / NFSX** – NanoFab South / NanoFab South Extension

2.7 **NFX** – NanoFab Xtension

2.8 **NY CREATES** – New York Center for Research, Economic Advancement, Technology, Engineering and Science

2.9 **SDS** – Safety Data Sheet

3. RESPONSIBILITIES

3.1 Employees, Partners, Subcontractors, and Guests

All who enter the cleanroom areas must be certified in Cleanroom Protocol Requirements per the details defined in this document. It is the responsibility of all employees who enter and/or work in the designated site area to comply with the requirements of this document. It is also their responsibility to ensure that visitors under their control follow all protocol requirements.

3.2 Partner Area Managers

For those managers who supervise activity in the cleanroom areas, it is their responsibility to ensure that employees and visitors are trained per this document. They shall also follow identified protocol requirements and take corrective action to maintain cleanroom levels. Area Managers shall approve cleanroom badge access for personnel in their respective work areas.

3.3 Cleanroom Manager (NY CREATES)

It is the responsibility of the Cleanroom Manager to supply and maintain garments, and to supply janitorial support. The Cleanroom Manager shall test the cleanliness of the cleanroom, review and post the cleanliness results for each work area, and initiate and/or coordinate any improvements necessary to maintain the cleanroom classification level.

4. ASSOCIATED DOCUMENTS

4.1 **ANT-02001:** Confidential Information Management

4.2 **EHS-00002:** Hazard Communication Program

4.3 **EHS-00010:** Personal Protective Equipment

4.4 **FED-STD-209E:** Airborne Particulate Cleanliness Classes in Cleanrooms & Clean Zones

4.5 **ISO-14644-1:** Classifications of Air Cleanliness

4.6 **ISO-14644-5:** Cleanroom Operations

4.7 **OPS-00005:** Cleanroom Tool Maintenance SOP

4.8 **OPS-00005-F1:** Cleanroom Tool Maintenance Form

4.9 **OPS-01012:** Wafer Logistics

4.10 **OPS-04005:** FOUP FOSB Handling & FOUP Maintenance

5. SAFETY

5.1 Safety Training

All people who work in the cleanroom areas are required to receive NY CREATES safety training and follow all applicable safety requirements. It is the Area Manager's responsibility to ensure that their employees are aware of and have received the required training for their work area and tool set. For further information on safety training, contact the NY CREATES Environmental, Health, and Safety (EHS) department.

5.2 Chemical Hazards

A solution of 10% IPA and 90% DI H₂O shall be used to wipe down items brought into the cleanroom. Gloves and safety glasses are the required personal protective equipment required for wipe down.

5.3 Chemical Information

Chemical labels that define the potential hazards in the work environment are found in each specific cleanroom area (NFS, NFN, NFC, NFX, and META). A Safety Data Sheet (SDS) is kept for each chemical listed on the Approved Chemical List (ACL). Employees, students, and other members of the Albany NanoTech Complex site with intranet access have immediate online access to the ACL and SDS for chemicals used on site.

The online SDS can be accessed from the NY CREATES intranet EHS homepage. NY CREATES' online SDSs can be accessed directly by means of a smartphone or computer at the HAZMIN website address: <http://cnse.comply1.com/>. SDSs can be requested by contacting EHS or ERT (reference **EHS-00002 – Hazard Communication Program**).

6. PROCEDURE

6.1 Cleanliness Classes

The NY CREATES NanoFab cleanroom locations are classified and managed as defined by specification FED-STD-209E.

**Table I: Cleanroom Particulate Criteria
For NanoFab South (NFS), North (NFN), Central (NFC), NanoFab
Extension (NFX), and Material Engineering Technology Accelerator
(META Center)**

Class	MEASURED PARTICLE SIZE					Location(s)
	0.1	0.2	0.3	0.5	5.0	
English	ft ³	ft ³	ft ³	ft ³	ft ³	
1	35	7.5	3	1	N/A	Mini-environment
10	350	75	30	10	N/A	Pass – through, MEV
100	N/A	750	300	100	N/A	NFN/NFC/NFX/ META Fab level
1000	N/A	N/A	N/A	1000	7	NFS, Annex, NFN, NFC, NFX, META Sub-Fab
10.000	N/A	N/A	N/A	10,000	70	Wipe-down areas

NOTE: The limits in Table 1 designate specific concentrations (particles per unit volume) of airborne particles with sizes equal to and larger than sizes shown in the table. The FED-STD-209E values will be used as the acceptance criteria for NFS/NFSX, NFN, NFC, NFX, and META Center work area cleanliness.

6.2 Pre-Entry Activities

6.2.1 Familiarity with this document is required prior to entry.

6.2.2 Footwear must cover the foot in its entirety. No open-toe footwear is allowed in gowning areas or cleanrooms (no Crocs, flip-flops, sandals, etc.).

6.2.3 Ensure all items being carried into the Cleanroom are approved for use (items to include: tools, equipment, handling carts, spare parts, writing utensils, computers, consumables, etc.).

- 6.2.4 Ensure that approved items are wiped down prior to entry with a solution of 10% IPA and 90% DI H₂O, using gloves and safety glasses.
- 6.2.5 Ensure that carts are free of debris and equipment wheels are covered/protected with cleanroom tape.
- 6.2.6 Ensure that tools are dedicated to cleanroom use and maintained in a clean manner.

6.3 Appropriate Behaviors/ Rules

NY CREATES and Partner management shall enforce the following rules. **Rule violations are treated on a case-by-case basis, and any recourse is at the discretion of the Operations Management Team, up to and including loss of cleanroom privileges and or SiView access:**

6.3.1 Those Who Enter the Cleanroom MUST:

- Scan all removable media through the anti-virus-scan software on a SMART SCAN STATION before entry. SMART SCAN STATIONS are located outside each fab gowning room. Along with removable storage media, only company-owned computers that have up-to-date patching and anti-virus protection will be allowed in the cleanrooms.
- Be trained and properly gowned before entering the cleanroom areas.
- Store personal items (coat, pocketbook) in locker or desk prior to entry.
- Minimize traffic through the entrance/exit doors. Cleanroom / gown room entry and exit flow must be followed as posted (see Section 6.5.2).
- Clean equipment and materials before entering the cleanroom.
- Keep materials, tools, carts, and equipment in their assigned areas.
- Keep personally clean – particularly hands, face, and hair; do not touch face with gloves.
- Use knife or scissors to open bags.
- Use cleanroom approved paper, notebooks, ball-point pens, and tape.
- Use NY CREATES phones for official use only. Cell phones, badges, and pagers to be worn on outside of jumpsuit.

- Wear their cleanroom badge and ensure that it is in a visible location on the outside of their jumpsuit. Use cleanroom computers and printers for official use only.
- **All Tenants and NY CREATES teams utilizing tools inside the cleanroom must use SiView as the point of record to track their work and utilization of the tool.** When processing lots, whether in Auto-1 or manually, FOUPs must be logged into SiView to record tool/lot history information.
- **Any manually processed lots must be virtually loaded to tool in SiView.** Once loaded, Operation Start should occur when the lot starts, and Operation Complete should occur once the lot finishes processing. Oper Start/Oper Complete times for manually processed lots should mirror physical Oper Start/Oper Complete times as closely as possible. **Virtually processing lots should not wait until after processing has occurred.** After processing, the FOUP should then be unloaded and both physically and virtually stocked in at either the current location or next location it needs to process.
- **Under no circumstance should a lot/FOUP be docked on a CSR or META RFD (Ready for Development), RFP (Ready for Production) or private tool (whether in Stand By, Engineering, or Scheduled Down Time), and not logged in SiView.** These lots must also be virtually processed through SiView upon completion of the manual operation. If completion of the lot will run into another shift(s), written instruction will be provided via email to OPS_MGMT@listserv.ny-creates.org, and covering technicians or engineers, as to what of the above instructions needs to be completed once the lot backs off of the tool and is sitting unload ready.

6.3.2 Those Who Enter the Cleanroom **MUST NOT:**

- Bring cigarettes, matches, lighters, tissues, brushes, combs, or any unauthorized materials into the cleanroom.
- Consume edibles (mints, gums, candies, etc.), drinks, or use tobacco or similar products in cleanroom or clean areas.
- Walk rapidly, jog/run, or move unnecessarily (try to minimize air disturbance).
- Bring in regular paper, cardboard, Styrofoam, bubble wrap, paper towels, or scotch tape in cleanroom. Exceptions must be approved by Fab Manager.

- Tear, cut, or rip paper while in the cleanroom.
- Touch vacuum surfaces, process chambers, equipment, or wafers without gloves.
- Bring wooden tool boxes, wooden-handled tools into cleanroom.
- Allow rust, oil, or peeling paint on tools or boxes.
- Allow impact-type printers, non-cleanroom paper, or pencils.
- Whistle, cough, or sneeze persistently.
- Unfasten cleanroom garments in cleanroom or pull items out through garments while in cleanroom.
- Carry materials into the cleanroom without prior cleaning.
- Pick up and use tools or materials off the floor, without prior cleaning.
- Slide material, equipment, or products on the floor, cabinets, or equipment.
- Use emergency exit doors – unless there is an emergency.
- Use hydrocarbon-based aerosol cans.
- Bring personally owned PCs into the cleanroom.
- If they are a Cleanroom Operator (CRO), bring removable computer storage media into the cleanroom.
- Wear cosmetics, perfume, cologne, or other similar scented products.
- Place lower extremities on FOUPs, carts, desks, racks, or tools.
- Place unauthorized items in FOUP RFID reservoirs (i.e., paper).
- Take pictures or videos inside the cleanrooms in NFN, NFX, NFS (including C4 Area), or META unless authorized by **ANT-02001 – Camera Use Permit**.
- Ensure that if listening devices are being used (earbuds, AirPods, headphones, etc.) that one ear must be free at all times.

6.4 Gowning Practices

6.4.1 Importance of Human Factors

Despite the various precautions taken to prevent contamination, particles generated by people are the most important concern in the cleanroom operation. Humans are the main source of water contamination. Proper awareness, attitudes, and behavior are required to properly control excess particles and minimize wafer contamination. *Remember, “We control the particle levels!”*

6.4.2 Cleanroom Garments: Changing and Disposal

- 1) Change cleanroom garments completely, once a week, at a minimum.
- 2) Do not allow garments to touch the floor during gowning.
- 3) Inspect garments for damage before donning. If damaged, do not wear.
- 4) If garment is ripped during use, replace immediately. Hand the ripped garment to the Cleanroom Coordinator or place in damaged bin for collection.
- 5) Gloves, booties, and hairnets (and beard covers, as appropriate) are to be disposed upon leaving the work area. Do not re-enter with used coverings.
- 6) Garment Attendant will “pull” cleanroom garments on a weekly basis for laundering purposes.
- 7) For any person handling heavy (>30 lbs.) equipment, parts or assemblies, steel-toed safety shoes are to be worn in the cleanroom areas. (This includes maintenance personnel, FOUP handlers, contractors doing work, etc.)
- 8) Safety Glasses are required to be worn in the cleanroom environment (as listed in **EHS-00010 – Personal Protective Equipment**).
 - a) Eye (e.g., safety glasses, goggles) and face protection (e.g., face shield) is required to be worn in posted areas and during tasks that create eye and/or face hazards.
 - b) Safety glasses with side shields are required to be worn to protect the eyes from flying particles, objects, chips, etc.
 - c) Goggles are required to be worn to protect the eyes from corrosive chemical (e.g., acid, base) splash hazards, dust hazards, etc.

- d) Under face shields, safety glasses with side shields or goggles must also be worn depending on the type of hazard.
- e) Although safety glasses should always be worn in cleanrooms and laboratories, the following is a list of tasks that are considered EXEMPT from the safety glasses requirement. The intention of these exemptions is to permit those that are performing such tasks to temporarily allow them to remove their safety glasses:
 - In cleanrooms while: working in front of a computer terminal (providing there is no eye hazard), transporting FOUPs, loading tools, and walking in a main aisle.
 - In research or teaching labs while: working in front of a computer terminal (providing there is no eye hazard), chemical and/or infectious material contact exposure.

6.4.3 Garment Components

6.4.3.1 For garments which require size determination prior to donning, and laundering after use:

- **Jumpsuit:** Fasten all snaps and zippers. Hang on dedicated hangers after use.
- **Hood:** Use when performing operations that could affect the quality of the processed wafer. Required when performing preventive maintenance on inside of equipment. Also, required in cleanrooms NFN, NFC, NFX, and META Center.
- **Face Cover/Masks:** Face covers/masks are used in accordance with this policy and NY CREATES' site policy (optional or mandated).

IMPORTANT: No masks worn on the outside of the cleanroom may be worn IN the cleanroom.

Current Storage Options for Cleanroom Masks

- 1) Using a beard guard, hang your mask inside your suit on the hanger. Do not hang your mask directly on the hanger.
- 2) Tying a sleeve and placing the mask in the sleeve.
- 3) Insert mask in hood, attach to where the hood would button to the gown and tuck into the suit.

NOTE: While performing tasks in the cleanroom, you **MUST** wear a site approved cleanroom facemask in accordance with site policies. The mask used **MUST** cover your nose and mouth. There are several types of site approved cleanroom masks; your management team is responsible for communicating to you which site approved mask you are allowed to wear in the cleanroom. Cleanroom cloth masks should be discarded on a daily basis at the end of your shift in separate containers from the hood and gowns, unless mandated by OPS Management otherwise.

6.4.3.2 Additional protective garments which are to be discarded after use:

- **Shoe Covers:** Use to prevent excessive dirt contamination.
- **Beard Cover:** To be worn by those with facial hair (mustache, beard).
- **Hairnet (bouffant):** To be worn under hood garment (if applicable). Tuck all hair inside of hairnet. Wear loosely so that it covers all hair and ears.
- **Gloves:** Tuck gloves under the jumpsuit wristband.

6.5 Entering Cleanroom

6.5.1 Only authorized, trained employees, partners, subcontractors, or guests are allowed to enter the NFS, NFC, NFN, NFX, or META cleanroom areas. Visitors shall be approved prior to entry.

6.5.2 Entry to the cleanroom areas is through the authorized gowning areas only.

IMPORTANT: You are no longer allowed to exit through the same door you entered for gowning in the NFN/NFC cleanrooms. You **MUST** exit the gowning area through the cleaners' consumable storage space in the gowning area. Remove gloves, booties, hairnets, etc. once inside the viewing corridor.

6.5.3 The use of authorized proximity badges allows workers to gain access. **No Tailgating!**

6.5.4 All who wish to enter the cleanroom shall complete the following steps in the sequence stated, based on the cleanroom area.

6.6 NanoFab Gowning and Entering Sequence

Nano Fabs North/Central/Extension/ META Fab Level (NFN, NFC, NFX, & META)	
Step #	Sequence Step
1	Clean off street shoes in the shoe brush vacuum to remove large particles. Use for 5 seconds on each shoe. NOTE: No open-toe footwear is allowed in gowning areas or cleanrooms.
2	Walk on tacky mat.
3	Use hand sanitizer on hands, then put on cleanroom gloves, and use sanitizer on gloves before moving forward with the rest of the cleanroom gowning procedures.
4	Put on hairnet. Contain all hair and cover ears.
5	Put on beard covers. Cover all facial hair. (To be worn for mustache, facial hair, and/or beards.)
6	Beard covers are still required for personnel with facial hair when entering the cleanroom even while wearing your cleanroom mask. The beard cover must cover the facemask at all times (for cloth masks you may wear the beard cover on the inside of the mask).
7	Pick up shoe covers. Sit on bench with feet on "dirty side." Place shoe covers on shoes, one at a time (up and over), placing covered shoes to "clean side" of cleanroom entranceway.
8	When performing operations in environments that could negatively impact the quality of the wafer, hoods, and facemasks are required (i.e., opening FOUPs). Mask requirements for cleanroom use will be utilized in accordance with site policies.
8a-d	<p><i>For example, these tasks may include:</i></p> <ul style="list-style-type: none"> <i>(a) Process chamber maintenance</i> <i>(b) Working in a mini-environment</i> <i>(c) Handling reticles</i> <i>(d) FOUP cleaning. Hoods and facemasks are usually donned at this step, or can be later donned at the work station.</i> <p><i>If face masks/covers are used, it must be in accordance with site policy (mandated or optional). The mask must cover your nose and mouth. Your facemask cannot leave the clean side of the gowning area, if so, it will require replacement with a clean mask. NOTE: Outside masks are not allowed in the cleanroom and must be stowed in beard covers hanging from hangars or on self.</i></p>
9	Locate jumpsuit and hood (plastic bag or dedicated hangar). Put on jumpsuit and hood. Ensure hood is tucked into the suit collar. Do not allow hood or upper jumpsuit to touch the floor while dressing. Discard plastic bag in trash bin.

**Nano Fabs North/Central/Extension/ META Fab Level
(NFN, NFC, NFX, & META)**

10	Inspect gowning attire for defects, proper wear, and badge visibly displayed. Verify containment of hair. Neck buttons snapped and zipper secured up to the collar (top).
11	Sanitize and put on safety glasses (as required or directed).
12	Enter cleanroom, moving slowly.

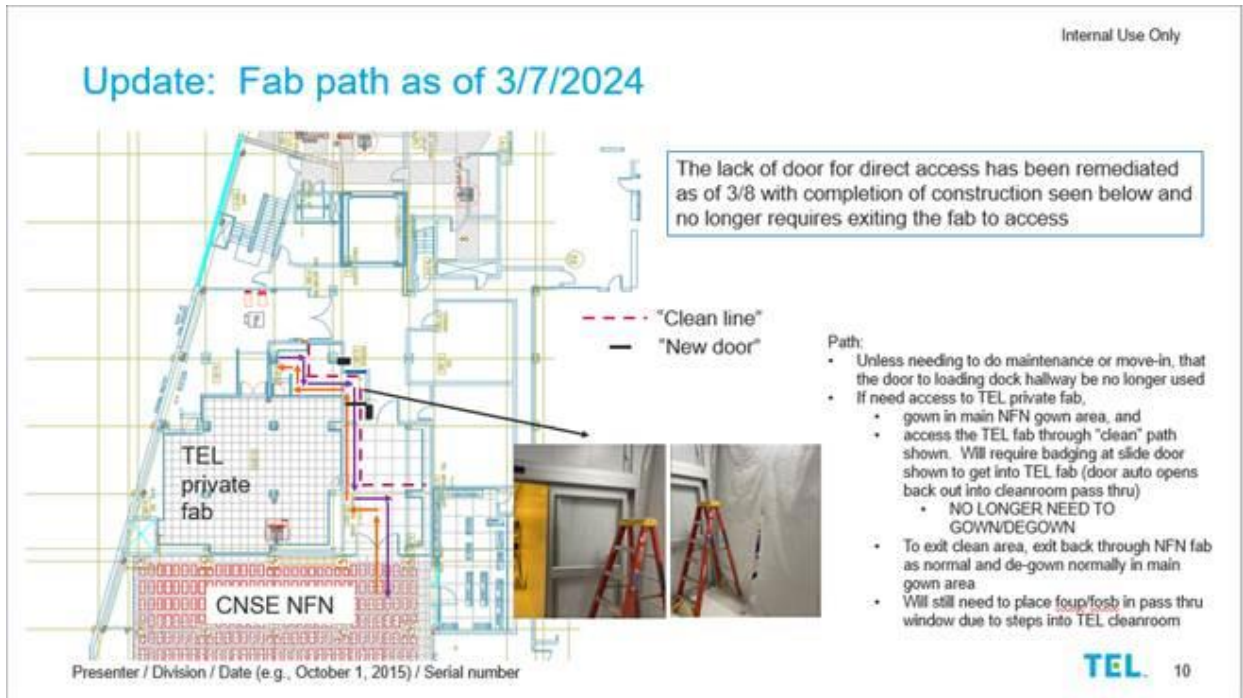
**Nano Fab South and South Annex
(NFS & NFS Annex)**

Step #	Sequence Step
1	Clean off street shoes in the shoe brush vacuum to remove large particles. Use for 5 seconds on each shoe. NOTE: No open-toe footwear is allowed in gowning areas or cleanrooms.
2	Walk on tacky mat.
3	Pick up shoe covers. Sit on bench with feet on "dirty side." Place shoe covers on shoes, one at a time (up and over), placing covered shoes to "clean side" of cleanroom entranceway.
4	Use hand sanitizer on hands, then put on cleanroom gloves, and use sanitizer on gloves before moving forward with the rest of the cleanroom gowning procedures.
5	Put on hairnet. Contain all hair and cover ears.
6	Put on beard covers. Cover all facial hair (to be worn for mustache, facial hair, and/or beards). Beard covers are required for all personnel with facial hair entering the cleanroom even when wearing a cleanroom mask (mandated or optional). The beard cover must cover the face and mask (if used by option or mandate) at all times while in the cleanroom.
7	When performing operations in environments that could negatively impact the quality of the wafer, hoods, and face masks are required.
7a-d	<p><i>For example, these tasks may include:</i></p> <ul style="list-style-type: none"> <i>(a) Process chamber maintenance</i> <i>(b) Working in a mini-environment</i> <i>(c) Handling reticles</i> <i>(d) FOUP cleaning. Hoods and facemasks are usually donned at this step, or can be later donned at the work station.</i> <p><i>If face masks/covers are used, it must be in accordance with site policy (mandated or optional). The mask must cover your nose and mouth. Your face mask cannot leave the clean side of the gowning area, if so, it will require replacement with a clean mask. NOTE: Outside masks are not allowed in the cleanroom and must be stowed in beard covers hanging from hangers.</i></p>

Nano Fab South and South Annex (NFS & NFS Annex)	
8	Locate jumpsuit plastic bag or dedicated hangar; put on jumpsuit. Do not allow upper jumpsuit to touch the floor while dressing. Discard plastic bag in trash bin. Hood use is optional unless required by step 7, by policy, or directed by Operations Management.
9	Inspect gowning attire for defects, proper wear, and badge visibly displayed. Verify containment of hair. Neck buttons snapped and zipper secured up to the collar (top).
10	Sanitize and put on safety glasses (as required or directed).
11	Enter cleanroom, moving slowly.

Nano Fab Central TEL Private Entrance (NFC LAM Area)	
Step #	Sequence Step
1	Clean off street shoes in the shoe brush vacuum to remove large particles. Use for 5 seconds on each shoe. NOTE: No open-toe footwear is allowed in gowning areas or cleanrooms.
2	Walk on tacky mat.
3	Use hand sanitizer on hands, then put on cleanroom gloves, and use sanitizer on gloves before moving forward with the rest of the cleanroom gowning procedures.
4	Put on hairnet. Contain all hair and cover ears.
5	Put on beard covers. Cover all facial hair. (To be worn for mustache, facial hair, and/or beards.)
6	Beard covers are still required for personnel with facial hair when entering the cleanroom even while wearing your cleanroom mask. The beard cover must cover the facemask at all times (for cloth masks you may wear the beard cover on the inside of the mask).
7	Pick up shoe covers. Sit on bench with feet on "dirty side." Place shoe covers on shoes, one at a time (up and over), placing covered shoes to "clean side" of cleanroom entranceway.
8	When performing operations in environments that could negatively impact the quality of the wafer, hoods and facemasks are required (i.e., opening FOUPs). Mask requirements for cleanroom use will be utilized in accordance with site policies.

Nano Fab Central TEL Private Entrance (NFC LAM Area)	
8a-d	<p><i>For example, these tasks may include:</i></p> <ul style="list-style-type: none"> (a) <i>Process chamber maintenance</i> (b) <i>Working in a mini-environment</i> (c) <i>Handling reticles</i> (d) <i>FOUP cleaning. Hoods and facemasks are usually donned at this step, or can be later donned at the work station.</i> <p><i>If face masks/covers are used, it must be in accordance with site policy (mandated or optional). The mask must cover your nose and mouth. Your facemask cannot leave the clean side of the gowning area, if so, it will require replacement with a clean mask. NOTE: Outside masks are not allowed in the cleanroom and must be stowed in beard covers hanging from hangars or on self.</i></p>
9	<p>Locate jumpsuit and hood (plastic bag or dedicated hangar). Put on jumpsuit and hood. Ensure hood is tucked into the suit collar. Do not allow hood or upper jumpsuit to touch the floor while dressing. Discard plastic bag in trash bin.</p>
10	<p>Inspect gowning attire for defects, proper wear, and badge visibly displayed. Verify containment of hair. Neck buttons snapped and zipper secured up to the collar (top).</p>
11	<p>Sanitize and put on safety glasses (as required or directed).</p>
12	<p>Enter cleanroom, moving slowly.</p>



6.7 Exiting Cleanroom

6.7.1 If garments are to be worn again, do not allow them to touch the floor during doffing. Garments are to be changed after one week of wear. The jumpsuits shall be placed on dedicated hangars. Hoods shall be snapped to the jumpsuit collar.

6.7.2 All disposable items (hairnets, shoe covers, beard covers, and gloves) are to be discarded after leaving the cleanroom entrance area. Take care not to remove shoe covers near entry path to minimize dirt transfer at the entrance zone.

6.7.3 In case of an emergency, do not remove cleanroom garments until after reaching the designated rally point. Upon returning, place the cleanroom garments in the “laundry” bin.

6.8 Special Protocol Requirements

6.8.1 Reticle Area

- 1) No one may enter the reticle area unless they have the appropriate Electro-Static Discharge (ESD) protection. There are NO exceptions.
- 2) Hoods, masks, and gloves shall be worn when doing manual mini-environment activity (i.e., reticle into carrier, etc.).

6.8.2 **FOUP Cleaning Area:** Hoods, masks and gloves must be worn when the carriers are opened.

6.8.3 **Pass-through Area:** The pass-through area is used for items that move from the external environment (dock, hall, etc.) to the Control Center and back. The doors must be firmly closed before the items can be retrieved – going back and forth, either way.

NOTE: Cleanroom garments must not be exposed to the external environment at any time.

6.9 Cleanroom Environmental Control

The following requirements are performed and ensured by the NY CREATES Cleanroom staff, and are the responsibility of the Cleanroom Manager. (Reference **ISO-14644-1 – Classifications of Air Cleanliness**, and **ISO-14644-5 – Cleanroom Operations** for specification details.)

6.9.1 Cleanroom Maintenance

- Each major cleanroom area shall be wiped down at a specified frequency, depending on the environmental conditions and particle prevention requirements.
- A solution of 10% IPA / 90% DI water shall be used as the cleaning agent, using proper wipe down procedures. The cleaning shall begin at the “cleaner area” (usually the furthest point away from the main pass through), and move towards the “more contaminated area” (usually around the pass through/exit area).
- Wipe down shall begin at the ceiling, continue to the walls and windows, continue with the equipment and tables, and end with the floor cleaning.
- All wipe down activities shall be logged; discrepancies shall be noted and brought to the attention of the Cleanroom Manager for corrective action.

6.9.2 Cleanroom Testing

- Weekly, at a minimum, each cleanroom area shall be tested with a particle monitoring device, in accordance with **FED-STD-209E**. The same locations shall be used for subsequent comparative testing.
- The particle monitor shall be capable of measuring the particle sizes specified in Table 1. These class limits shall be used as the baseline for acceptance criteria.
- Particle data gathering is the responsibility of the Cleanroom Manager. Cleanliness results shall be posted in the work area. Discrepancies shall be identified and brought to the attention of the appropriate Partners and NY CREATES Operations Groups for corrective action.

6.9.3 Cleanroom Operating Parameters

Room Cleanliness	<p>Class 1000 minimum, in North/Central/Extension Sub-Fab/META, South, and South Annex</p> <p>Class 100 minimum, in North/Central/Extension Fab level</p>
Room Temperature	68 deg. F, +/- 2 deg.
Room Humidity	45%, +/- 5%

6.9.4 Tool Maintenance (see OPS-00005)

- Prior to proceeding with any maintenance or cleaning activities in the cleanroom, on tools that contain hazardous production materials (HPMs), the Tool Owner must complete **OPS-00005-F1 – Cleanroom Tool Maintenance Form**. HPMs are materials that have a degree-of-hazard rating in health, flammability or reactivity of Class 3 or 4, as ranked by the National Fire Protection Agency.
- Tool Maintenance Forms (**OPS-00005-F1**) must be submitted to the EHS Department for approval and coordination five (5) days prior to the event. If the event is part of a routine maintenance activity that has already been evaluated by EHS and the necessary controls have been put in place, at that time, EHS shall determine the need for the completion of this form.

6.10 **Restricted Use Substances**

The following cleaning materials have been restricted for use inside the NFS, NFSX, NFC, NFN, NFX, and META cleanrooms:

6.10.1 100% Isopropyl Alcohol (IPA)

- The use of 100% Isopropyl alcohol has been restricted in the NFS and NFSX cleanrooms due its known cross-sensitivity to the SCOTT Instruments Ammonia and Carbon Monoxide sensors.
- If detected by either of these sensors, an alarm will be produced and potentially evacuate the cleanroom.
- Contact Cleanroom Operations prior to using 100% IPA on any of the following tools: TXE01, TXF03, NFSX Gas Farm, TSF01, ISE02, and NFS Gas Farm. An evaluation will be performed and local exhaust ventilation will be installed, if necessary.

- For those working in the NFN, NFC, NFS, NFX, NFSX, and META cleanrooms, if you do not have a flammable cabinet readily available to store IPA and you will not be using it on the aforementioned tools, Cleanroom Operations can offer to still store this material for you.

6.10.2 Fluorinert

- The use of Fluorinert has been restricted due to its known cross-sensitivity to the Nitrogen Trifluoride sensors. If detected by these sensors an alarm will be produced and potentially evacuate the cleanroom. If you wish to use Fluorinert in the NFS, NFSX, NFC, NFN, NFX, and META cleanrooms you must contact the EHS Department to do so. EHS will evaluate the area where the Fluorinert will be used, determine the vicinity of the Nitrogen Trifluoride sensors, and install local exhaust ventilation, if necessary.

6.10.3 Chemical Materials with Hazard Ratings of 3 or 4:

EHS-00002 – Hazard Communication Program, provides further details on chemical restrictions:

- **Health: 3-4** – Use with appropriate PPE and local exhaust ventilation.
- **Flammable: 3-4** – Store in approved containers and cabinets – away from sources of ignition.
- **Reactivity: 3-4** – Handle appropriately and store away from incompatible materials, since it readily reacts with air, water, and/or other materials.

6.11 South Annex Area Protocol

Workers who have authorized access to the rear entrances of the South Annex building shall perform tasks per the following protocol:

	Cleanroom Category	
	Dirty	Clean (1000)
Primary Entry room	Yes	
South Dock Area (tape demarcation for pass thru)	Yes	
CMP Corridor	Yes	
Chemical Waste Area	Yes	

- 6.11.1 All traffic into the back of the South Annex shall be through the badge-accessible door. The oversized dock doors are only to be opened from the inside, and specifically used for sending or receiving of oversized items.
- 6.11.2 The **Primary Entry** room is used for personnel and items entering directly from outside the building.
- 6.11.3 The **South Dock Area** is used for moving items in/out the South Annex and NanoFab South cleanrooms. Any oversized items brought directly into the dock must follow the same cleaning procedures as in the Primary Entry room.
- 1) Ensure that **ONLY ONE** door is open at a time.
 - 2) Do not block the main doorway, as it is the main artery for the South Annex emergency evacuation route.
- 6.11.4 The **CMP Corridor** area is used as an access route to the Chemical Waste Area and to the South Dock area.
- 6.11.5 The **Chemical Waste Area** is used for gathering chemical waste. Site safety protocol must also be followed in this area.

6.11.6 “**Dirty Areas**”: Primary Entry room, South Dock area, and CMP Corridor – dirty side. These areas are classified as “dirty” areas. Workers following Class 1000 cleanroom protocol are not permitted. The following rules shall be followed:

- 1) Personnel shall clean off shoes / boots with the shoe cleaner. A wet / dry vacuum is to be used for excessively dirty weather conditions.
- 2) Gloves, booties, and safety glasses are required (at the Primary Entrance).
- 3) Items shall be wiped down before continuing further into the building.
- 4) All items need to be removed from cardboard or wood in this area.
- 5) Painted gas cylinders shall be bagged and taped. Flaking paint or rust is not acceptable; all exposed surfaces shall be protected.
- 6) Striped tape denotes the boundary between the “dirty” and “clean” sides.

7. PHOTOGRAPHING AND VIDEO RECORDING

7.1 Acquire a dedicated camera, or dedicated work issued device provided by your management. Camera use and user must be authorized by their organization and in accordance with **ANT-02001-F1 – Camera Use Permit**.

Contents of captured pictures or videos from within the cleanrooms shall be uploaded by organizationally approved methods and/or through a secure media.

You may only use a dedicated work issued camera, or cell phone to photograph / video record in the cleanrooms spaces after acquiring a camera use permit.

Absolutely no personal cell phones should be used in the cleanrooms for videos or photography.

8. WAFER AND FOUP HANDLING

8.1 Wafers must be handled in accordance with **OPS-01012 – Wafer Logistics**.

FOUP handling and opening (when authorized) will performed in accordance with **OPS-04005 – FOUP FOSB Handling and FOUP Maintenance**.

9. QUALITY RECORDS

Training records are maintained by the respective NY CREATES or Partner Area Managers. Training records are submitted to NY CREATES EHS as one input for obtaining access badges to the appropriate cleanrooms.