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**Procedure
for**
Equipment Commissioning

REVISION HISTORY

Rev No.	DCN No.	Change Summary	Release Date	DCN Initiator	Document Owner
17	DCN2362	Updated for current practices on site, including Final Utility Turn On. Added Area Status Section.	8-10-22	D. Brookhart	T. Diamond

Prior revision history, if applicable, is available from the Document Control Office.

1. INTRODUCTION

- 1.1 This procedure is for use at NY CREATES / SUNY Polytechnic Institute (SUNY Poly) sites, such as [as but not limited](#) to the Albany Nanotech Complex and the Rochester campus to assist in the equipment commissioning process. The content of the Equipment Commissioning Inspection Record (**EHS-00017-F1**) is intended to stimulate relevant code, environmental, health and safety (EHS) review for the equipment and its installation and address the regulatory and EHS considerations [for the installation or modification](#).

2. PURPOSE

- 2.1 To ensure that equipment within the scope of this procedure are designed, engineering changed, installed, and commissioned in a manner consistent with applicable codes, regulations, [site](#) procedures, and sound engineering practices.
- 2.2 To proactively address [EHS](#) concerns related to the design, installation, engineering change, startup, operation, and maintenance of equipment within the scope of this procedure.
- 2.3 The Equipment Commissioning Inspection Record provides a record of each equipment commissioning [or modification](#) and the associated review process.

3. SCOPE

- 3.1 The Equipment Commissioning Inspection Record (**EHS-00017-F1**) is for use in reviewing and approving the equipment (e.g., laboratory, semiconductor, test) to be used on site. The form is divided into three (3) parts.
- Part 1 covers the conditional use of the equipment's electrical, mechanical, non-HPM chemicals and facilities services used for troubleshooting and debugging purposes.
 - Part 2 covers the release and conditional use of the equipment's Hazardous Production Materials (HPMs) and physical hazards for equipment operation.
 - Part 3 covers the final acceptance and approval of the equipment.
- 3.2 The [Conditional Use portion of EHS-00017-F1](#) is posted on the equipment to indicate the status on the use and/or commissioning of the equipment. The Inspection Record form must be completed prior to releasing the equipment to the Equipment Owner ([EO](#)) for process transition and operational use.

4. ASSOCIATED DOCUMENTS

- 4.1 **EHS-00017-F1** – Equipment Commissioning Inspection Record
- 4.2 **EHS-00017-F2** – Tool Owner Matrix Form
- 4.3 **EHS-00017-F3** – EHS Equipment Safety Compliance Inspection Checklist, an optional form created to assist those involved in factory source inspections or final install locations for equipment. While comprehensive, it is not intended to be all inclusive and should be used to review the equipment to ensure proper EHS compliance.
- 4.4 **EHS-00017-F4** – Utility Turn On | Off Request Form
- 4.5 **EHS-00031** – [Procedure for Toxic Gas Monitoring System \(TGMS\) Requirements and Configuration](#)
- 4.6 **EHS-00048-F1** – Requirements for Class 3B and 4 Lasers
- 4.7 **EHS-00064** – [Specifications for Support Equipment Requirements for Semiconductor, Laboratory and Facility Equipment](#)
- 4.8 **EHS-00066-F2** – Radiation Device Inventory
- 4.9 **EHS-00066-F4** – Non-Ionizing Radiation Equipment Inventory
- 4.10 **EHS-00066-F5** – Laser Inventory [Form](#)
- 4.11 **EHS-00072** – Specification for Lift Stations

5. DEFINITIONS

The following definitions apply to this procedure and the corresponding Equipment Commissioning Inspection Record (**EHS-00017-F1**).

- 5.1 **Bulk Chemical Delivery System** - A system that consists of chemical storage vessels located outside of the fabrication area from which chemicals are delivered, via distribution piping, to equipment located in the fabrication area.
- 5.2 **Equipment Owner (EO)** - As it relates to this procedure, the **EO** is the person listed as the "Applicant" on the Equipment Commissioning Inspection Record form. In the event that a more appropriate party exists, it shall be the responsibility of the "Applicant" to designate the person who will fulfill the responsibilities of the **EO** during the commissioning process.
- 5.3 **Equipment-Specific** - An item is considered to be equipment-specific if it is installed specifically to accommodate, either wholly or in part, the

presence of the equipment being installed or is installed internally to the equipment itself.

- 5.4 **Hazardous Energy** - Hazardous energy includes, but is not limited to, electrical, mechanical, hydraulic, pneumatic, chemical, thermal, ionizing radiation, non-ionizing radiation, and other types of energy. Lockout/tagout (LOTO) procedures must consider all hazards associated with all types of energy that may be related to the activity to be performed.
- 5.5 **HPM** - A solid, liquid, or gas associated with semiconductor manufacturing that has a degree-of-hazard rating in health, flammability, or reactivity of Class 3 or 4 as ranked by the National Fire Protection Association and is used directly in research, laboratory or production processes that have as their end products materials that are not hazardous.
- 5.6 **Local Dispense Chemical Delivery System** - A local dispense chemical is one that is stored in and/or dispensed from a vessel that is internal to the equipment or is delivered to the equipment from storage vessel(s) located in a dispensing cabinet that is remote from the equipment but located within the fabrication area.
- 5.7 **Non-HPM** - A solid, liquid or gas that has a degree-of-hazard rating in health, flammability, or reactivity of Class 0, 1 or 2 as ranked by the National Fire Protection Association (NFPA 704). Non-HPM chemicals are those that pose minimal, if any, hazards to personnel who may be exposed to them. They are the only chemicals that may be introduced to the equipment upon Part 1 sign-off of the Equipment Commissioning Inspection Record.
- 5.8 **Point-of-use** - The point-of-use is considered to be that point on the external surface of the equipment that is nearest to the point of connection of gas, liquid, or vacuum supply lines to the equipment. Point-of-use labels are intended to identify all gas, liquid, and vacuum lines, and electrical cords at the point of connection to the equipment.
- 5.9 **Fan Filter Unit (FFU)** - A type of air filtering equipment used to supply purified air to microenvironments by filtering out harmful airborne particles from recirculating air.
- 5.10 **Clean Environment** - An engineered enclosure system used to maintain low-particulate environment around a semiconductor production-related process using FFU's. Temperature, overpressure, relative humidity, air flow and make-up air may be controlled. Interfaces are carefully designed to maintain the conditions inside the enclosure.
- 5.11 **Chemical Dispense Unit (CDU)** - A fully enclosed, noncombustible enclosure used to provide an isolated environment for liquid chemical in storage or in use.

- 5.12 **Chemical Valve Manifold Box (CVMB)** - A fully enclosed, noncombustible enclosure with branch valving used to provide multiple outputs from a single supply chemistry.
- 5.13 **Make-Up Air Unit (MAU)** - A HVAC unit used to control temperature, humidity, and, as required, cleanroom pressurization air and replenish outside air lost through exhaust systems.
- 5.13.1 **Lift Station Design A** - The simplest unit designed for just water applications. Typically design A is used for condensation from equipment such as a MAU (make-up air unit) or janitorial slop sink.
- 5.13.2 **Lift Station Design B** – A unit used for single chemistry (only one specific chemical drain system) or drain from a point of use (POU) abatement unit where all the chemistries are compatible with one another.
- 5.13.3 **Lift Station Design C** – A unit used for multiple chemical drain systems where there is a potential of incompatible chemicals mixing in the lift station.

6. RESPONSIBILITIES

- 6.1 The **EO** or Equipment Engineer (**EE**) requesting permission to commission equipment on site will complete the **EHS-00017-F1**.
- 6.2 The **EO** or **EE** is responsible to ensure that each item listed on **EHS-00017-F1** is complete and will initial all items that are not marked N/A. The designated EHS, Facilities Engineering, and Facilities Operations Group (**FOG**) Departments will review and approve **EHS-00017-F1** and required documentation in order to approve use of the equipment and its systems, facilities services, and chemicals.
- 6.3 The groups to be represented on the Equipment Commissioning Inspection Acceptance and Sign-off Team are as follows:
- Installation Coordinator (IC) / Construction Manager
 - Equipment Owner (EO)
 - Equipment Engineer (EE)
 - NY CREATES Facilities System Owners (as applicable)
 - NY CREATES Operations Manager (as applicable)
 - NY CREATES Equipment Engineering Manager
 - NY CREATES Environmental, Health and Safety
 - NY CREATES Facilities Tool Hook-up Manager
- 6.4 The number of responsible parties will vary depending on connections required for the equipment installed **or modified**. The responsible parties' acceptance and approval signatures indicate that all the checklist items that they are responsible for are complete.

- 6.5 The Equipment Commissioning Inspection and Acceptance and Approval Team members will meet as necessary to complete their assigned inspection record responsibilities. Each **EHS-00017-F1** item will be verified and initialed by the **EO or EE** and a representative from EHS.

7. PROCEDURE

The **Conditional Use portion of EHS-00017-F1 shall be** posted on the equipment to indicate the status of the equipment.

7.1 Equipment Commissioning Inspection Record: Part 1

Part 1 of the **EHS-00017-F1** is designed to ensure the equipment is ready to be energized for conditional use. **This may include** electrical and/or mechanical debug purposes. Once the equipment is set, leveled, and electrical and facilities connections are made, a review of the installation **will** be performed using the Part 1 Inspection Record.

Upon completion of Part 1, electrical power, vacuum, and non-HPM gases and liquids may be supplied to the equipment. Completion of Part 1 allows equipment system checks to be performed that are necessary prior to the introduction of HPMs or other hazardous energy sources associated with the equipment.

7.1.1 Electrical Matrix

All sources of electricity to the equipment must be listed. These sources can either be listed in the electrical matrix or on an attachment. All sources of electricity may be energized upon completion of the Part 1 Inspection Record.

7.1.2 Electrical Safety Requirements

The electrical portion of the installation must be checked for correct connections, voltages, proper grounding, verified to be free from short circuits (megger tested), fully labeled showing the source panel(s) and circuit number(s), the presence of lockable disconnects, correct panel, switch, disconnect and tool status indicator labeling, **and** other requirements **for the items being connected**. Documentation from the person performing these checks shall be provided **and placed in the book** prior to Part 1 sign-off.

7.1.3 LOTO and Control of Hazardous Energy Source(s)

LOTO procedures must be developed specific to the equipment being installed. The **EO or EE** is responsible for the development of such procedures and providing a copy to EHS.

Prior to Part 1 sign-off, all hazardous energy sources, including electric, non HPMs, and HPMs, **shall** be locked out

7.1.4 Radiation

All sources of ionizing (Gamma, X-ray, and sealed sources) and non-ionizing (Ultra-Violet, Infra-Red, Microwave, and Radio Frequency) radiation must be enclosed, interlocked, and properly labeled.

All sources of ionizing radiation must be registered with New York State Department of Health (NYSDOH) by the NY CREATES Radiation Safety Officer (RSO). **EHS-00066-F2 – Radiation Device Inventory, and EHS-00066-F4 – Non-Ionizing Radiation Equipment Inventory must be filled out, sent to the RSO, and placed in the greenbook prior to Part 1.**

Radiation baseline surveys must be performed the first time radiation is produced by the equipment. All necessary radiation surveys must be scheduled to ensure that they are performed in a timely manner to support equipment installation. No radiation may be produced until approved in Part 2.

7.1.5 Lasers

Equipment that contains lasers must certify compliance with 21 CFR 1010 and 1040, and with ANSI Z136.1. This equipment must be labeled properly, must have properly functioning interlocks, have the laser surrounded by protective housing, be reviewed by the NY CREATES Laser Safety Officer (LSO), and be added to the **Site Laser Inventory via EHS-00066-F5.**

Additional protective measures must be implemented in cases where there is open beam exposure potential to Class 3 and 4 Lasers (see **EHS-00048-F1** for requirements).

7.1.6 Non-HPM Gas/Liquid & Vacuum Facility Lines

A listing of all facility lines delivering non-HPM gases or liquids, natural gas, or vacuum to the equipment, shall be provided.

Accepted abbreviations (e.g., CDA, UPW, etc.) may be used, if preferred. The **EE or EO** shall also list all non-process chemicals used in the tool and/or its peripherals.

7.1.7 Labeling and Guarding

This is a review of the applicable labels, guards, and shields that shall be installed on the equipment. Labels shall be placed on the equipment at appropriate, easily visible, locations indicating hazards within the equipment.

Contact information shall be clearly visible on the equipment and be displayed by posting the Tool Owner Matrix (EHS-00017-F2).

If the TO, EE or any other emergency contact information changes at any point the Tool Owner Matrix (EHS-00017-F2) shall be updated immediately by the new TO or EE and placed on the tool.

7.1.8 Personal Protective Equipment (PPE)

The EO or EE is responsible for assessing the equipment operation and/or maintenance tasks to determine if there are hazards which necessitate the use of Personal Protective Equipment (PPE). If PPE is needed the EO or EE must select and provide the types of PPE that will protect the employee(s) from the hazards identified in the hazard assessment before operation and maintenance tasks. The selection of PPE shall be provided to EHS for review.

7.1.9 Seismic Restraints

Ensure appropriate seismic restraints are designed. They must be installed prior to Part 2 signoff.

7.1.10 Punch List

All deficiencies discovered must be listed as a punch list item prior to Part 1 sign offs. All punch list items need to be closed out prior to the completion of Part 3.

7.1.11 Part 1 Interim Sign-Offs

This section serves three functions:

- 1) Allows EHS to provide approval for electrical and non-HPM turn on for electrical and mechanical debug of the equipment.
- 2) Allows Facilities System Owners to give approval for electrical and non-HPM turn on while ensuring Facilities System Owners are aware of new loads on electrical and non-HPM systems prior to being turned on.
- 3) Provides a location for IC, EO, and EE to certify that the equipment is ready for electrical and non-HPM turn on.

IMPORTANT: Upon completion of Part 1 Sign-Off, electricity and non-HPMs can be requested to be turned on.

7.1.12 Preliminary Utility Turn On

Preliminary Utility Turn On shall be made for the purposes of testing and commissioning systems and equipment. Preliminary Utility Turn On is performed prior to completion of the Part 1 signoff and is only a temporary turn on to allow for pressure testing and documentation.

The IC shall make requests for Preliminary Utility Turn On by emailing **EHS-00017-F4** to TOOL_TURN-ON@LISTSERV.SUNYPOLY.EDU a minimum of 48 business hours in advance. Requests will be reviewed and approved by the system owners through email. Requests for utility turn on sent to CNSEFix@sunypoly.edu will be RETURNED to requestor which could potentially delay the scheduling request.

Include all the information on **EHS-00017-F4**.

- Turn On | Off Date,
- Building, Utility,
- Level,
- Bay,
- Column/Range,
- POC,
- Turn On | Off, Time,
- Comments for [unique requirements](#) or conditions.

Utilities will be energized as expeditiously as possible. The availability of individuals to accommodate the equipment commissioning schedule is dependent upon many factors including current work assignments and staffing.

The IC shall coordinate turn on dates and times with the contacts listed on the Tool Utility Turn-on Matrix. The IC or a representative shall be present at the time of turn on.

7.2 **Equipment Commissioning Inspection Record: Part 2**

Part 2 of [EHS-00017-F1](#) is used to verify that the equipment is ready for HPM use and other potential hazards (e.g., radiation, laser, etc.) are ready to be energized. Upon completion of Part 2, the equipment may be approved to become fully functional, and is released for process qualification and commissioning.

7.2.1 General

General safety topics that are not normally mentioned otherwise, such as: informing the ERT Coordinator ([ERTC](#)) and ERT Leaders about the installation and associated emergency procedures, discussion of new hazards, equipment or conditions that exist that would require the ERT to

be specially trained, identification and labeling of any confined spaces, completion of a noise survey if necessary, and appropriate illumination of the work area.

Part 2 will NOT be completed unless all ERT's have signed this part prior to EHS coming out for review. To schedule a review or receive an exemption from ERT review contact the ERTC.

7.2.2 Exhaust Ventilation

The evaluation of exhaust ventilation is to ensure that the exhaust ducts are **tested**, balanced, and labeled. It also ensures that exhaust ducts carrying HPMs have continuous monitoring devices installed. Where lab hoods or wet benches are utilized a face velocity between 80 – 120 feet per minute **shall** be attained.

7.2.3 Vacuum Pumps

While all vacuum pumps can be checked during Part 1, only those vacuum pumps associated with non-HPM **gas(es) or liquid(s)**, process vacuum, and exhaust ventilation may be energized upon completion of Part 1.

All pumps handling toxics, pyrophorics, or other HPMs must remain locked out until completion of Part 2.

7.2.4 Chemicals and Gases

All chemicals, not listed in the non-HPMs section in Part 1 that are supplied to the equipment or on board must be listed in **section D**. An indication of the type of container **in which the chemical is stored prior to or during use by the equipment, use information, volume and approval status is to be supplied**.

For the purposes of this procedure, the following definitions apply:

- **A bath** is a container that is normally open on top during normal operation of the equipment.
- **A tank** is any other type of container that is normally completely enclosed during normal operation of the equipment. All bulk chemicals are assumed to originate from a tank.

7.2.5 Chemical and Gas Systems Requirements

The systems requirements ensure that all the supply lines and containment piping are properly labeled and tested and are double contained, where required.

It also sets forth requirements for testing and verification of leak detection systems, specific requirements for pressurized chemical containers, HPM delivery lines, HPM shut-off valves and separation of flammable and combustible materials, and access to emergency eyewashes and/or showers. This also sets forth the requirements to ensure all gas and chemical delivery systems internal and external to the tool are leak checked and that the completed Leak Check documentation is submitted to the appropriate NY CREATES Facility System Owner.

7.2.6 Detection/Monitoring Requirements

This section confirms that all detection points have been installed as required and all detectors have been tested and signed documentation of the testing has been provided.

7.2.7 Chemical Disposal Requirements

Drain lines must be labeled and leak checked prior to use in accordance with the [NYS Plumbing Code](#). The drain system, the material it is constructed of, the leak check results and whether the piping is properly labeled must be listed in this section. The [EE](#) is responsible for preparing and submitting chemical drain emission calculations to EHS demonstrating that the concentration of chemicals that are being discharged and treated by the water treatment plant are below the required permit limit.

The [EE](#) ensures that appropriate waste collection equipment is provided, as needed, and the equipment is ready for use.

7.2.8 Post-Process Exhaust Treatment Systems

This section is to ensure that any required post-process exhaust treatment systems are operational. The Equipment Engineer ensures that post-process exhaust treatment systems are operational and are sufficient to abate exhaust. The [EE](#) is responsible for preparing and submitting air emission calculations to EHS demonstrating that the concentration of chemicals/gases that are being discharged are treated effectively by the assigned post process exhaust treatment system.

7.2.9 Fire Protection Requirements

This section applies to all equipment-specific fire detection, monitoring, suppression, and alarm systems. This includes systems internal to the equipment itself and systems that are installed to accommodate the presence of the equipment that is being installed (e.g., sprinklers in the bay ceiling that service the area occupied by the equipment).

Installations that are required by the International Fire Code [and](#) that are tied to the Building Fire System must be approved, [installed and](#) verified

by a [NYS](#) certified installation contractor. This is a checkpoint to ensure the necessary tests have been conducted, and documents provided by the fire system(s) installers.

7.2.10 Interlocks and Emergency Machine Off (EMO)

The supplier of the equipment must provide an interlock matrix, listing all interlocks that are specific to the equipment. This matrix should be attached to [EHS-00017-F1](#). All interlocks listed on the matrix must be verified to be functional. Interlocks present on peripheral equipment (i.e., vacuum pumps, exhaust treatment systems, gas detection systems, etc.) are to be tested and the test must be documented. It is important to ensure that any changes to the equipment or the operating system do not affect the functionality of any interlock(s). Interlocks must be re-tested and verified to ensure functionality after every such change.

In case of an alarm, area alarm control ([AAC](#)) panels connected to [TGMS](#) must have interlocks to stop the gas flow into a gas cabinet. Any other interlocks, like an EMO being pressed or a status signal from the tool or process chamber/module is not mandatory to have connected to the [AAC panel](#) but will be utilized if connections are available on the system.

The equipment may be powered up to test EMO functionality only after all other Part 1 items have been verified. The tool must then return to a completely locked-out state until [Part 2](#) is approved.

7.2.11 Radiation Requirements

All ionizing and non-ionizing radiation producing equipment must be surveyed by the [RSO](#) or designate the first time it is powered on [and the date of this shall be documented on EHS-00017-F1](#).

7.2.12 Clean Environments

Installation of a new clean environment must include an evaluation of the sprinkler protection within the clean environment. A maintenance plan for filter cleaning/replacement must be provided to EHS.

7.2.13 Lift Station Design

Prior to the use of a lift station, the lift station must meet all the requirements in [EHS-00072](#) - Specification for Lift Stations.

7.2.14 Area Status

Prior to the full commissioning of any equipment, the area must be signed off on that there are no housekeeping, access or egress concerns and this section is mandatory.

7.3 Part 2 Interim Sign-offs

This section serves two functions:

- 1) Allows EHS to provide partial approvals in phases as the equipment is prepared for use.
- 2) Allows the Facilities System Owners to provide approval to turn on applicable facility services. It also ensures Facilities System Owners are aware of new loads on applicable systems prior to being turned on.

7.3.1 Final Utility Turn On

Final Utility Turn On shall be made for the purposes of releasing systems and equipment for development.

The EE or EO shall make requests for HPM turn on to EHS and chemservice@listserv.sunypoly.edu.

They shall list all gasses and chemicals they want activated as part of each request.

EHS will then review and reply.

The EE or EO shall also make requests for Final Utility Turn On by emailing **EHS-00017-F4** a minimum of 48 business hours in advance to TOOL_TURN-ON@LISTSERV.SUNYPOLY.EDU. Requests will be reviewed and approved by the System Owner through email. Requests for utility turn on sent to CNSEFix@sunypoly.edu will be RETURNED to requestor which could potentially delay the scheduling request.

Include all the information on **EHS-00017-F4**.

- Turn On | Off Date,
- Building, Utility,
- Level,
- Bay,
- Column/Range,
- POC,
- Turn On | Off, Time,
- Comments for unique requirements or conditions.

Utilities will be energized as expeditiously as possible. The availability of individuals to accommodate the equipment commissioning schedule is dependent upon many factors including current work assignments and staffing.

The EE or EO shall coordinate turn on dates and times with the contacts listed on the Tool Utility Turn-on Matrix. The EE or TO shall be present at the time of utility turn on.

7.3.2 Utility Turn Offs shall follow the same request procedure as Utility Turn On.

7.4 Part 2 Punchlist Items

Any deficiencies that are discovered during the Part 1 and Part 2 that do not directly impact the safety of the equipment or the installation are to be listed in the Part 2 punch list. The party responsible for completing each punch list item will be listed, as well. Punchlist items must be completed in a timely manner and must be completed before Part 3 is completed.

7.5 Equipment Commissioning Inspection Part 3 Final Acceptance and Approval Signatures

Successful completion of all checklist items allows full approval of the EHS-00017-F1. Only upon completion of all checklist items, including those designated as deficient or punch list items, may the commissioning be approved.

All parties must wait to sign the appropriate signature block until all checklist items, for which they are responsible, are verified.

EHS must wait until all signatures above it have been obtained. The NY CREATES Facilities Tool Hook-up Manager will sign after all signatures have been obtained.

8. RECORDS

The Equipment Commissioning Inspection Record serves as documentation of the individual equipment being commissioned and accepted and will be archived for future reference by EHS.