

Sandia National Laboratories
Primary Hazard Screening (PHS)
PHS Number: SNL06A00448-010
CINT (clean room, all labs) - Integration Lab

I. Signatures (Electronic signature dates shown)
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Risk Management Determination

Hazard Classification: **Low****Operations with hazards that have the potential for significant local impacts.**Required Documentation: **A PHS with Integral HA is required**Facility/Project Designator: **Radiological Facility**Date Created: **07/30/2014**DOE Order References: **425.1D**Results as of: **10/10/2014**Submitted for Review by: **Nogan,John**Org: **01132** Date: **09/02/2014**

Author / Technical Review

Assignment Completed

I am knowledgeable of the activities and hazards covered by this PHS and, after doing due diligence, the description, notes, identified hazards, analyses, and other information contained in this PHS are complete and accurate.

Please also review any other information in the PHS (e.g. description, notes, hazard tables, hazard assessments) necessary to perform your review assignment.

I have performed the review assignments shown above and concur that the document is complete and accurate.

Author: **Nogan,John**Org: **01132**CONCUR ON SUBMIT:
09/02/2014

Assignment Completed

Review Question 5c(1) for classification of UNP use

Review Question 5i for classification of pyrophoric chemical or metal powder use

Review Question 21 and hazard-specific question sets that relate to the user-specified hazards identified in Question 21

Please also review any other information in the PHS (e.g. description, notes, hazard tables, hazard assessments) necessary to perform your review assignment.

I have performed the review assignments shown above and concur that the document is complete and accurate.

Industrial Facility Safety Basis SME: **Curran,Kelsey**
Leigh FordeOrg: **04126**CONCUR: **09/09/2014**

ES&H Coordinator Review

Assignment Completed

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have performed the above reviews and concur that those items are complete and accurate.

Please also review any other information in the PHS (e.g. description, notes, hazard tables, hazard assessments) necessary to perform your review assignment.

I have performed the review assignments shown above and concur that the document is complete and accurate.

ES&H Coordinator: **Nelson,John Seth**

Org: **01100**

CONCUR: **09/16/2014**

Quality Review

Assignment Completed

This PHS meets minimum Corporate standards for 1) description/notes and 2) required information. There are no gross inconsistencies. I have performed the above reviews and concur that those items are complete and accurate.

Please also review any other information in the PHS (e.g. description, notes, hazard tables, hazard assessments) necessary to perform your review assignment.

I have performed the review assignments shown above and concur that the document is complete and accurate.

PHS Team: **Hall,Christopher Armando**

Org: **04126**

CONCUR: **09/17/2014**

Approver

Assignment Completed

The description and notes describe and scope the activities performed under this PHS. All hazards have been identified. Questions are answered correctly and, as necessary, rationale or clarification is provided. All hazards in the HA have been analyzed, including the identification of controls for each hazard. I have reviewed this PHS and concur that its contents are accurate and complete. I will ensure that the requirements and commitments in this PHS are implemented prior to the start of work.

Please also review any other information in the PHS (e.g. description, notes, hazard tables, hazard assessments) necessary to perform your review assignment.

I have performed the review assignments shown above and concur that the document is complete and accurate.

Approving Manager: **Shinn, Neal D.**

Org: **01130**

APPROVE: **09/17/2014**

II. PHS Purpose, Limitations, and Use in Work Planning and Control

Purpose of the PHS

For the scope of work identified, the PHS identifies:

- High-level (primary) hazards (e.g. chemicals, toxic gasses, explosives)
- Some, but not all controls (e.g. PPE, respirators, ventilation, lockout/tagout, and NEPA), please see the [limitations section](#), below for additional information.
- Hazard Classification, which determines the requirements for additional Safety Basis documents [e.g., Hazard Analysis (HA), Safety Assessment (SA), Safety Assessment Document (SAD), Documented Safety Analysis (DSA) etc.]

For the hazards and controls identified, the PHS enables the identification and communication of:

- Requirements documents (such as Corporate Policy System sections) that must be reviewed to determine specific requirements applicable to the work.
- Corporate Policy System-required training.
- Action and Warning messages that highlight key requirements.

The Hazard Analysis section of the PHS is used to perform a high-level hazards analysis and controls selection for hazards with a Hazard Classification of "Low" and, optionally, for Standard Industrial Hazards (SIH).

Limitations of the PHS for Use in Activity-level Work Planning and Control

Unless additional information is specifically added, a PHS **does not** contain all of the detail necessary to identify and control hazards at the activity/task level. The reasons for this include:

- PHSs are typically written at the project or work-area level and therefore, do not contain sufficient detail about individual tasks or the hazards/controls associated with them.
- While the PHS provides requirements for the hazards and controls identified, it **does not** provide a comprehensive list of all requirements in the Corporate Policy System and related documents. Furthermore, many of the requirements are identified by reference to sections of the Corporate Policy System, which must be evaluated for requirements applicable to the specific work being performed.
- It is impractical to ask enough questions to generate the level of detail necessary for activity/task-level hazard identification and control; human analysis must be employed. Consequently, details must be developed by a work planner, including:
 - Specific details about the hazard (e.g. what chemical, which laser, when, under what conditions, and where)"
 - Other controls needed, since the only controls automatically identified are the ones with Corporate Policy System requirements that result from their use. Important controls, such as access control, interlocks, shielding, monitoring, and personnel qualifications are not identified.
 - Specificity about controls (e.g. type of PPE, ventilation specifications)
 - Details on how and when you implement each control
 - Information on who needs to take what training

Recommended Use of the PHS to Support Activity-Level Work Planning & Control

The information developed in the PHS and any resultant Safety Basis documents should be utilized when performing the subsequent task of activity-level hazard identification, analysis, and control selection, where (1) the major work steps are identified; (2) the hazards associated with each major step are identified and analyzed; and (3) the controls for each hazard are identified and verified to be adequate to protect the involved workers. For the vast majority of work performed at Sandia, the Job Safety Analysis form (SF 2001-JSA) or equivalent is the recommended tool to use for this purpose. The JSA provides a systematic process for a team of involved workers and SMEs to ensure the activity-level work scope is rigorously analyzed to identify all potential hazards and specify appropriate controls for each hazard. Information from the PHS and Safety Basis documents is used as an input in developing the JSA, and the results of the JSA are used to develop TWDs, procedures, or other work instructions as appropriate.

In some cases, the PHS system may be used for activity level hazard identification, analysis, and controls identification, however, the PHS usually must be supplemented with additional information to provide the level of detail necessary to serve this purpose. In these cases, a PHS should be designated as an "Activity-Level PHS" on the PHS General Information page; however, these PHSs will be reviewed during the review and approval process to confirm that they contain the detail necessary to identify the hazards and controls at any stage of the work being performed. If determined to not be adequate, options include (1) revising the PHS to include adequate information; or (2) removing the "Activity-Level PHS" designation, and using a JSA/JSA-equivalent process to perform activity-level hazard identification, analysis, and control selection.

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III. General Information

Document Status

Question Set Version: **M**

Status: **Approved**

Expiration Date: **09/17/2015**

Responsible Organization: **01132**

Operation Type: **Facility or Lab**

Radiological Protection Level

Radiological Protection Level for this facility or project: **Normal**

Description

The integration wing of the CINT Core facility is a clean room where the bays are class 1000 and the chases, gowning room (1508), and parts clean room (1511) are class 10,000. The operations in the clean room are focused on micro- and nano-fabrication of devices for the study and development of nano-technology. These processes include, but are not limited to, wet and dry etching of Si and GaAs, deposition of metal, insulators and semiconductors, contact mask photo-lithography, electro-beam lithography, and focus ion beam machining. These processes will require the use of both gaseous and liquid hazardous chemicals that are typically used in microfabrication.

Room 1501: The Electron Beam Lithography Area. This encompasses the tools and support equipment needed to form patterned structures on substrates down to the nanometer scale. These patterns are formed using high-energy electrons that impinge upon charge-sensitive resist materials. Upon exposure and development of the resist, these patterns can be transferred to the underlying substrate using additive or subtractive cleanroom techniques. Electron beam resist is spin-coated onto wafers or small substrates and baked. These samples are loaded into the electron beam lithography system (JEOL JBX-6300FS) where they are written with the electron beam. After pattern development, additive or subtractive methods can be used to transfer the pattern to the substrate. Other cleanroom tools and techniques are generally combined with the electron beam lithography process area to realize nanofabrication on various material systems. Only authorized users of the electron beam lithography system are allowed to work under this PHS. Users can be authorized through an extensive On The Job Training (OJT) program. This is an ongoing activity at the CINT facility and it is anticipated to continue throughout the lifetime of the e-beam system.

Room 1504 - HIRES SEM/Mask Writer Area. This room contains a FEI focused ion beam (FIB)/ scanning electron microscopy (SEM) tool. The primary function of this tool is to micro machine surfaces using a 10 nm wide stream of gallium ions in high vacuum. The system is also used for the visual analysis of materials and surfaces down to 20 nm. Although the SEM/FIB is a registered radiation generating device (RGD) it contains the proper level of shielding to make it inherently safe for individuals working in the area. A Heidelberg Instruments Inc. DWL 66-fs Lithography Mask laser writer is located adjacent to the SEM. The laser writer contains a class 3B Diode laser, 80 mW @ 400 nm that is interlocked to be inherently safe during normal operation.

Room 1506 is the central storage area for general laboratory supplies and serves as a pass through for the transfer of processing chemicals into the cleanroom. No lab work done in this area.

Room 1507 is the pregowning room where the activities are restricted to the initial gowning and there will be no lab

work done in this area.

Room 1508 is the gowning room where the activities are restricted to the final gowning and there will be no lab work done in this area.

Room 1511 is the parts clean and assembly area. The wet processing bench in 1511 supports etching of Si using TMAH or KOH solutions, and supports general base etch and cleaning processes. The solvent bench provides a ventilated workspace for removing photoresist or for general surface cleaning and degreasing. Two high speed diamond saws and a scribe and break tool support back end of line (BEOL) dicing of Si, ceramic and glass substrates. The lapping tool allows materials such as glass and silicon to be thinned and or polished.

Room 1512 is the Flex Bay designated for specialized processing techniques and basic device characterization. The most hazardous operation in the bay is an Atomic-Precision Fabrication Tool (APFT) that utilizes phosphine gas and hydrogen to electronically dope a silicon surface. The phosphine gas is sourced from a safe-source SDS delivery cylinder. The SDS cylinder contains a small amount of phosphine (PH₃) absorbed into a carbon media. This highly toxic substance (PH₃) in carbon is designed to be desorption limited in order to prevent a high level release. Hydrogen is also sourced from a small sample container that is integrated into the tool. Other operations in the area include a probe station for both semiconductor analysis and for the electro-deposition of bound engineered nanomaterials in an ethanol solution.

Room 1515 is the main equipment pass through for the cleanroom. Equipment entering the cleanroom is wiped down in this area in preparation for entry. Equipment leaving the cleanroom also pass through this area. Heat transfer fluids, pump oils and other flammable materials in support of cleanroom operations are stored in the flammable storage cabinet. No lab work is done in this area.

Room 1517 is the house keeping room, where the sink and supplies for cleaning of the Integration Lab are stored. No lab work done in this area.

Room 1516 is the chemical and integration lab storage room, which is used to store silicon substrates, temperature sensitive polymers and solvents that require refrigeration, non-precious deposition metals and targets, and diagnostic equipment. Chemicals and materials are segregated and stored in properly designated locations. No lab work done in this area.

Rooms 1522 and 1523: Designated as the chase and lithography room, respectively. Chase 1522 function is to provide space for the storage of personal protective equipment (chemical aprons and face shields) and provide service access to back of the 1523 processing equipment. No laboratory experiments will be performed in this area. Room 1523 will be used for the process and associated metrology of contact mask lithography. This includes processing of industry standard photoresist, which typically requires spinning the photoresist on a wafer followed by exposing using a NUV 365-400 nm or DUV 260 nm contact mask aligner, or ebeam writer and baking at up to 400C on a hot plate or up to 200C in an oven. After pattern exposure and soft bake, the photoresist is then developed at the base bench using a dilute TMAH or KOH solution. An O₂ barrel ash reactor and UV ozone cleaner are used for the purpose of cleaning light organic materials from a substrate's surface following the develop operation. Solvents are used at the solvent bench for the purpose of degreasing a surface or for the removal of photoresist. Metrology equipment includes an optical microscope for visual inspection.

Room 1525: This bay contains multiple vacuum deposition systems (base pressure 10⁻⁷ torr) which include PVD by electron beam and PVD by sputter or reactive sputter. The ebeam allows for the deposition of high purity material typically used in lift-off and subtractive etching processes. The sputtering system provides a means to deposit conformal metal, semimetal or insulating (dielectric) thin films typically for subtractive etch processes. A profilometer located in the bay provides a method for the measurement of post PVD deposition film thickness.

The chemical benches will be used for standard processing of devices fabricated on Si wafers. Typical processes will include metal lift-off by the removal of photoresist and degreasing using solvents, acid and base wet chemical etching of metals, Si, and SiO₂ and other common processes. The rapid thermal anneal (RTA) uses a set of lamps to rapidly heat silicon wafers to temperatures in excess of 1000C in an inert environment, such as Argon. Additionally, forming gas (3% H₂ in nitrogen) can be used in the RTA to prevent oxide formation during annealing.

Chase 1526: Support equipment such as pumps, cryo compressors, 3.8% hydrogen/balance nitrogen compressed gas supply for RTA and cold storage for 1527 ALD reactor precursors. Precursors are stored in quantities of less than 100g each in stainless steel containers at 5C in an appropriately identified explosion proof refrigerator.

Room 1527: Bay 1527 has two inductively coupled plasma (ICP) etch reactors and a plasma enhanced chemical vapor deposition (PECVD) reactor. The PECVD reactor allows the conformal deposition of hydrogenated amorphous poly-Si, silicon nitride, and silicon oxides. The ICP etch reactors are used for dry etching of materials such as aluminum, titanium, tungsten, carbon, oxides, nitrides, polysilicon, among other materials. Opposite the etch reactors is an atomic layer deposition (ALD) apparatus that deposits monolayers of aluminum oxide, platinum, titanium nitride, zirconium oxide, hafnium oxide, and others. This bay also contains a combination electron beam/thermal evaporation deposition system (base pressure 10⁻⁷ torr) for high quality metal depositions. A spectroscopic reflectometer also located in the bay provide a means for dielectric thin film measurement. Additionally, a scanning laser 3a tool, called a Flexus, is located in 1527 and used to measure wafer curvature. The system is interlocked for safety purposes.

Chase #1528: The toxic gasses are self-contained within built-in toxic gas cabinets in each tool supporting room #1527. Silane (100%) is contained in a fully automatic gas cabinet that is located next to the PECVD reactor pumps. There are toxic gas monitoring sensors located in each of the gas cabinets and in the vicinity of the tools to detect leaks and shut down the gas at the cylinder in the event of a leak.

Room 1530: Bay 1530 contains a Inductively Coupled Plasma Silicon Deep Reactive Ion Etch system (ICP SiDRIE) for the purpose of high aspect ratio Si etching, a fluorine reactive ion etch (F-RIE) for the purpose of etching some metals, organics and various dielectrics, and a Down Stream Low Frequency (DSLRF) ash system for surface cleaning and to strip organic polymers such as photoresist. A discrete wavelength ellipsometer allows for refractive index and dielectric thin film measurement and a profilometer provides a contact method for measuring step height and surface roughness. A critical point dryer located in the bay allows delicate structures and membranes to be dried without risking damage to the device.

Chase #1531: The Non-toxic gasses are stored in chase #1531 and plumbed into bays throughout the cleanroom, the chase environment is monitored for oxygen deficiency.

Room 1532: Bay 1532 contains a furnace configured for Low Pressure Chemical Vapor Deposition (LPCVD) and thermal oxidation of thin films including, polysilicon, silicon dioxide and silicon nitride. Toxic gas monitoring for hydrogen chloride, silane and ammonia is integrated into the furnace's source cabinet and interfaces with the facility TGMS.

Chase #1533: Vacuum pumps, point of use fume scrubber, dichlorosilane and ammonia gas cabinets supporting the LPCVD furnace are all located in this chase. The chase environment is monitored for hydrogen chloride, silane and ammonia.

The Toxic Gas Monitoring System (TGMS) system is comprised of a decentralized Life Safety Network based on the LonWorks Technology with intelligent network nodes. The digitally networked input/output devices will notify personnel and shut down equipment based on a program customized for the requirements of the CINT Integration Labs. Network devices include Honeywell (MST Technology) Satellite FTT gas monitors, Echelon digital interface modules, bus monitors, a Local Information Display and DVS (Data Visualization System). Output devices include

beacons/horns, relay shut down of gases and signals to the Sandia Fire Protection panel for notification to the Sandia Emergency Operation Center.

Chemical hazards have been evaluated in the following ESHERs. No concerns were identified.

- ER2007-2552 - Lab 1504
- ER2007-2559 - Lab 1501
- ER2007-2646 - Lab 1522
- ER2007-2630 - Lab 1525

Notes

General Document Notes

9/28/09 - Mike Starr entry:

The environmental hazard table notes "Sterilized Bio Wastes" which is incorrect. There isn't any biological work performed in the integration lab. This entry will be deleted during the next review.

Locations

Site	Area	Building	Room	Description
Primary Location				
SSTP	No Tech Area	518	1501	
Other Locations				
SSTP	No Tech Area	518	1504	
SSTP	No Tech Area	518	1511	
SSTP	No Tech Area	518	1512	
SSTP	No Tech Area	518	1513	Room 1513
SSTP	No Tech Area	518	1519	
SSTP	No Tech Area	518	1522	
SSTP	No Tech Area	518	1523	
SSTP	No Tech Area	518	1524	
SSTP	No Tech Area	518	1525	
SSTP	No Tech Area	518	1526	

SSTP	No Tech Area	518	1527	
SSTP	No Tech Area	518	1528	
SSTP	No Tech Area	518	1530	
SSTP	No Tech Area	518	1531	
SSTP	No Tech Area	518	1532	
SSTP	No Tech Area	518	1533	

Responsible Organization History

Organization Number	Effective (Starting) Date	This Org. Submitted Document for Review
01132	06/11/2004	Y

Planned Changes

Updated area descriptions, added more detail for chase 1526 relating to ALD precursor cold storage and use of the area. Also included additional information to the HA relating to UNP.

IV. Identified Hazards

Hazard Name	Hazard Description	Source
Radiation generating devices	Potential for minor injury or illness	QUESTION 1
RGD (inherently safe)	Potential for minor injury or illness	QUESTION 1b(1)
Chemicals	Potential personnel exposure to chemicals & fire protection regulatory requirements	QUESTION 5
Unevaluated chemical use	Potential chemical overexposure	QUESTION 5a
Unbound Engineering Nanoscale particles	Unbound Engineered Nanoscale Particles(UNP); Potential inhalation and dermal exposure to UNP.	QUESTION 5c
Unbound Engineered Nanoscale (UNP) Particles	Potential inhalation and dermal exposure	QUESTION 5c(1)
Asphyxiant gas	Asphyxiant gas is present	QUESTION 5d(1)
Corrosive chemical	Corrosive chemical; Potential exposure to skin and eyes.	QUESTION 5e
Hydrofluoric Acid	Potential exposure to skin and eyes	QUESTION 5e(1)
Noncompliant storage, dispensing, or use of flammable or combustible liquids	Fire/Explosion Hazard	QUESTION 5g
Chemical physical hazards	Hazards from fires, reactions, and explosions	QUESTION 5h
Flammable gasses 500-1000 CF	Potential fire and explosion	QUESTION 5h(1)a
Pyrophoric chemicals or metal powders in quantities greater than 100g	Increased hazards from fires, reactions, and explosions.	QUESTION 5i
Toxic materials	Potential exposure to toxic gases/liquids/vapors in the event of a release	QUESTION 5k(1)
General Electrical Hazard	Potential for electrical shock	QUESTION 6
Electrical equipment (not approved by NRTL or Sandia)	Unknown hazard potential since items have not gone through the standards, testing rigor, and hazard analysis associated with an NRTL-evaluation	QUESTION 6a
Exposed energized circuits	Potential electrical shock or arc	QUESTION 6b
Exposed energized circuits	Potential electrical shock or arc flash	QUESTION 6b(2)
Exposed energized circuits	Potential electrical shock or arc flash	QUESTION 6b(3)
Mechanical hazards	Potential injury from mechanical forces	QUESTION 7
Portable power tools	Potential injury from portable power tools	QUESTION 7b
Nonionizing radiation	Potential exposure to nonionizing radiation.	QUESTION 8a
Nonionizing radiation	Potential exposure to nonionizing radiation below exposure limits.	QUESTION 8a(1)
Thermal hazard	Contact with hot or cold objects	QUESTION 9a
Pressure source	Injury or damage	QUESTION 10

Hazard Name	Hazard Description	Source
Potential environmental concerns	Potential for regulatory action	QUESTION 15
Wastewater discharge	Potential to exceed permitted quantities	QUESTION 15a
Air discharge	Potential to emit regulated contaminants	QUESTION 15b
Hazardous waste	Potential for regulatory action	QUESTION 15d
Low - Offsite Work Condition -MOW	Hazards from work conducted offsite by Members of the Workforce	QUESTION 21a(1)a
Exposure to hazardous energy	Potential injury to personnel from exposure to hazardous energy	QUESTION C3

V. Required Actions

Reviewer Imposed Requirements

1. Required completion of stand alone HA to verify facility hazard classification prior to next PHS review. Imposed by reviewer in role: ISMS_IFSBReviewer. Concerning: QUESTION 21a(1).
2. Required completion of stand alone HA to verify facility hazard classification prior to next PHS review. Imposed by reviewer in role: ISMS_IFSBReviewer. Concerning: QUESTION 5c(1).
3. Required completion of stand alone HA to verify facility hazard classification prior to next PHS review. Imposed by reviewer in role: ISMS_IFSBReviewer. Concerning: QUESTION 5i.

Readiness Messages

Readiness Review Requirements: Prior to start or restart of Low Hazard operations, the manager shall ensure that a Low hazard review (LR) is completed in accordance with Tool RR-02-T, "Startup/Restart Review for Standard Industrial Hazard and Low Hazard Operations Checklist," of MN471017, *Safety Basis Manual*. Restart, in this context, is the resumption of operations after any change that modified:

- Hazards
- Controls, engineered or administrative (e.g., Safety Management Programs, TWDs)
- Physical configuration of the facility or laboratory
- Training for workers

It is a managers responsibility to grade the readiness review in accordance with the magnitude and significance of the changes that have occurred.

Warning Messages

1. Radiological safety training shall include procedures specific to an individual's job assignment. See MN471016, Section 3.4.3.2, "Job-Specific Training," for requirements and guidance. (QUESTION 1)
2. There are a variety of requirements applicable to chemicals. Refer to the portions of Corporate Policy: ESH100, Environment, Safety and Health relevant to the activities being performed for requirements. (QUESTION 5)
3. 10 Code of Federal Regulations Part 851, Worker Safety and Health Program, as implemented through various SNL requirement documents (e.g., PG470246, "10 CFR 851 Worker Safety and Health Program Plan"), requires an exposure assessment of chemical hazards to ensure hazards have been identified and prevented or abated (QUESTION 5a)
4. Members of the Workforce and Visitors meeting any of the following criteria are required to participate in SNL's UNP Worker Registry:
 - 1) Have the potential for inhalation or dermal exposure to UNP;
 - 2) Routinely spend time in an area in which UNP have the potential to become dispersed in the air or on surfaces; or
 - 3) Perform work on equipment that might contain or bear UNP and that could release UNP during servicing or maintenance (QUESTION 5c)
5. All electrical equipment that is not NRTL-listed must be evaluated by an authorized equipment inspector. Contact your ES&H Coordinator if additional information is needed on equipment inspections or to identify an authorized equipment inspector. (QUESTION 6a)

6. WARNING: Work on energized electrical circuits is restricted to certain individuals. Ensure only qualified personnel perform work on electrical equipment/systems at SNL. It is the responsibility of the department manager to determine an employee's electrical qualifications. Managers may contact Electrical Safety personnel for assistance with determining worker qualifications or additional information. To become qualified to perform electrical work a person shall do the following:

Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/review) or direct observation, with the hazards of the workplace and the specific equipment to be worked on, as well as any associated ES&H Procedures.

Demonstrate a familiarity, through interview, demonstrated experience (i.e., resume/reference) or direct observation, with electrical maintenance techniques, codes and other general electrical knowledge.

Have qualifications reviewed and approved by their department manager to ensure they are qualified for a particular job assignment.

Note: A person qualified to work with certain equipment may be considered "unqualified" to work on similar equipment without first being advised of any differing hazards involved. (QUESTION 6b)

7. Energized work activities are any activities performed within the limited approach boundary of exposed (able to be contacted) and energized (> 50 volts) electrical conductors or circuit parts. Simply entering the limited approach boundary invokes the requirements identified in question 6b. (QUESTION 6b(2))

8. WARNING: An evaluation should be conducted using the Energized Work Decision tool each time electrical equipment is either added or existing energized equipment is manipulated or reconfigured. (QUESTION 6b(2))

9. WARNING: Unqualified workers may not do the following:

Enter inside any Limited Approach Boundary unless escorted by qualified worker.

Enter inside the Restricted Approach Boundary for any reason.

Enter inside the Flash Protection Boundary without contacting Electrical Safety. (QUESTION 6b(2))

10. WARNING: An evaluation should be conducted using the Energized Work Decision Tool to determine appropriate electrical PPE prior to work on each energized system. Prior to PPE use, workers shall receive site-specific PPE training. The Energized Work Decision Tool is located on the Electrical Safety Homepage under Decision Trees. See Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment" for requirements regarding site-specific PPE training. Refer to MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment" for additional information as needed. (QUESTION 6b(2))

11. Prior to performing maintenance activities, ensure an approved lockout/tagout procedure is developed and used. (QUESTION 6b(2))

12. Energized work operating procedures must be approved by a senior manager and are required for entry. These activities are always considered high rigor. (QUESTION 6b(3))

13. Manager or appropriate individual may require specific training such as OJT, etc. This training should be included as part of the work planning and control process. (QUESTION 6d)

14. All operators of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PQF) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure operators. (QUESTION 10a)

15. All installers of the system must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PIQ) is available as an optional tool for documenting the applicable training and qualification requirements for pressure applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of pressure installers. (QUESTION 10b)

- 16.** All operators who work with cryogenics must be qualified according to the requirements of the Pressure Safety Manual. The Pressure Operator Qualification Form (SF 2001-PQF) is available as an optional tool for documenting the applicable training and qualification requirements for cryogen applications. See MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program," for requirements and guidance on qualification of cryogen system operators. (QUESTION 10c)
- 17.** There are requirements for waste minimization and documentation of waste minimization efforts/results. Contact the Pollution Prevention (P2) Team and/or refer to website <http://info.sandia.gov/esh/p2/TechnicalAssistance.html> if assistance with waste minimization documentation is needed. (QUESTION 15d)
- 18.** All contractors performing servicing and maintenance on SNL-owned equipment shall perform LOTO when required in accordance with 29 CFR 1910.147 (OSHA Standards for General Industry) and comply with the following two additional requirements: (1) The contractor shall be briefed on SNL-specific LOTO devices and procedures applicable to the equipment under maintenance. (2) The contractor shall inform the SNL equipment owner and other authorized or affected workers of the contractor's energy control procedure/process, including any differences between that process and SNL-specific requirements. (QUESTION C3a(1)a)
- 19.** Ensure periodic inspections are appropriately documented and retained by appropriate LOTO administrator or ES&H Coordinator. (QUESTION C3a(1)c)

Action Messages

- 1.** Contact Radiation Protection to conduct a radiation survey (QUESTION 1a)
- 2.** Contact your Division ES&H Team Industrial Hygienist to evaluate exposure to chemicals and determine control measures, prior to working with chemicals. (QUESTION 5a)
- 3.** Ensure suitable facilities for emergency quick drenching or flushing of the eyes and body are provided within the work area for immediate emergency use, where eyes or body of any person may be exposed to injurious corrosive materials. See Corporate Procedure: ESH100.2.IH.13, "Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use," as needed for requirements. (QUESTION 5e)
- 4.** Store, dispense and bond flammable or combustible liquids in accordance with the requirements in the SNL, "Record of Code Decision." (QUESTION 5g)
- 5.** Implement actions and control measures specified in the applicable Industrial Hygiene exposure assessment. (QUESTION 8a)
- 6.** Obtain a National Environmental Policy Act (NEPA) checklist determination for all activities. Contact your ES&H Coordinator, NEPA Subject Matter Expert (SME), or Qualified NEPA Reviewer (QNR) if assistance is desired with this determination and/or process. (QUESTION 15)
- 7.** Submit documentation for discharge permits and request written approval for all process discharges. Contact the Waste Water Subject Matter Expert or the appropriate wastewater contact under the ES&H/EM Contact List if assistance is needed. (QUESTION 15a)
- 8.** Contact your Environmental Compliance Coordinator (ECC) or the Hazardous Waste Management Facility (HWMF) at (505) 844-3470 (SNL/NM only) to determine how to appropriately manage hazardous waste. (QUESTION 15d)
- 9.** Develop equipment specific procedures for servicing and maintenance according to the requirements of Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)" (QUESTION C3a(1)b)

Required Training

PHS Identified Training

[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area. Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]

Course Code	Course Title	Exclusions	Training Interval (years)	One-time Training
CHM100	CHEMICAL SAFETY TRAINING		3	No
	Required by: QUESTION 5			
CHM103	SITE-SPECIFIC CHEMICAL SAFETY TRAINING		3	No
	Required by: QUESTION 5			
ELC200	ELECTRICAL SAFETY FOR ELECTRICAL WORKERS		3	No
	Required by: QUESTION 6b(2), QUESTION 6b(3)			
ENV112	HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING		1	No
	Required by: QUESTION 15d			
ESH100	ES&H AWARENESS		1	No
	Required by: general corporate business process			
ESH200	SAFETY MANAGEMENT		--	Yes
	Required by: general corporate business process			
LTO210	LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS		5	No
	Required by: QUESTION 6b(2), QUESTION C3a(1)b			
MCH200	HAND AND POWER TOOL SAFETY		--	Yes
	Required by: QUESTION 7b			
MED105 HF	HYDROFLUORIC ACID SAFETY		3	No
	Required by: QUESTION 5e(1)			
NANO101	NANOTECHNOLOGY SAFETY AWARENESS TRAINING		3	No
	Required by: QUESTION 5c			
PPE106	PERSONAL PROTECTIVE EQUIPMENT TRAINING		3	No
	Required by: QUESTION C2a(1)a			
PRS115	CRYOGEN SAFETY		--	Yes
	Required by: QUESTION 10c			

PRS115R	CRYOGEN SAFETY REFRESHER		3	No
	Required by: QUESTION 10c			
PRS150	PRESSURE SAFETY ORIENTATION		--	Yes
	Required by: QUESTION 10a, QUESTION 10b			
PRS150R	PRESSURE SAFETY ORIENTATION REFRESHER		3	No
	Required by: QUESTION 10a, QUESTION 10b			
PRS250	ADVANCED PRESSURE SAFETY		--	Yes
	Required by: QUESTION 10b			
PRS250R	PRESSURE SAFETY ORIENTATION REFRESHER		3	No
	Required by: QUESTION 10b			
RAD102	GENERAL EMPLOYEE RADIOLOGICAL TRAINING		2	No
	Required by: QUESTION 1b(1)			
RAD219	RADIATION-GENERATING DEVICE CUSTODIAN TRAINING		2	No
	Required by: QUESTION 1			
RAD250	MANAGEMENT OF RADIOLOGICAL OPERATIONS		2	No
	Required by: QUESTION 1			
RSP215	AIR-PURIFYING RESPIRATORY PROTECTION		1	No
	Required by: QUESTION C2a(1)b			
RSP217	COMPREHENSIVE RESPIRATORY PROTECTION		1	No
	Required by: QUESTION C2a(1)b			
RSP230	RESPIRATORY PROTECTION FOR SUPERVISORS		1	No
	Required by: QUESTION C2a(1)b			

Regulatory Requirements

Regulatory and Standards Drivers for this Facility or Lab. [Note: CPS Manual sections listed below contain requirements and guidance that pertain to the hazards you have identified in this PHS. It is your responsibility to ensure these requirements have been fulfilled.]

1. (QUESTION 15) Corporate Procedure: ESH100.1.EP.2, "Implement NEPA, Cultural Resources, and Historic Properties Requirements"
2. (QUESTION C4) Corporate Procedure: ESH100.1.EP.2, "Implement NEPA, Cultural Resources, and Historic Properties Requirements"
3. (QUESTION 15b) Corporate Procedure: ESH100.2.ENV.12, "Obtain and Comply with Air Permits"
4. (QUESTION 15d) Corporate Procedure: ESH100.2.ENV.15, "Manage Hazardous Waste at SNL/CA"
5. (QUESTION 15d) Corporate Procedure: ESH100.2.ENV.20, "Manage Other Waste at SNL/CA"
6. (QUESTION 15d) Corporate Procedure: ESH100.2.ENV.22, "Manage Hazardous Waste at SNL/NM"
7. (QUESTION 5) Corporate Procedure: ESH100.2.ENV.27, "Maintain an Accurate Chemical and Biological Material Inventory"
8. (QUESTION 15a) Corporate Procedure: ESH100.2.ENV.6, "Control Discharges to the Sanitary Sewer System"
9. (QUESTION 5g) Corporate Procedure: ESH100.2.FP.1, "Manage Fire Protection Requirements"
10. (QUESTION 8) Corporate Procedure: ESH100.2.IH.10, "Evaluate and Control Nonionizing Radiation"
11. (QUESTION 8a(1)) Corporate Procedure: ESH100.2.IH.10, "Evaluate and Control Nonionizing Radiation"
12. (QUESTION 5e) Corporate Procedure: ESH100.2.IH.13, "Work with Injurious Corrosive Materials and Manage Safety Shower and Eyewash Use"
13. (QUESTION C1) Corporate Procedure: ESH100.2.IH.15, "Control Hazards Using Local Exhaust Ventilation and High Efficiency Particulate Air Filters"
14. (QUESTION 5c) Corporate Procedure: ESH100.2.IH.16, "Evaluate and Control Unbound Engineered Nanoscale Particles"
15. (QUESTION 5d(1)) Corporate Procedure: ESH100.2.IH.19, "Evaluate and Control Asphyxiant Hazards"
16. (QUESTION C2a(1)b) Corporate Procedure: ESH100.2.IH.3, "Control Inhalation Hazards Using Respiratory Protection"
17. (QUESTION 5) Corporate Procedure: ESH100.2.IH.4, "Evaluate and Control Chemical Hazards"
18. (QUESTION 5d(1)) Corporate Procedure: ESH100.2.IH.9, "Enter Confined Spaces Safely"
19. (QUESTION 7b) Corporate Procedure: ESH100.2.IS.10, "Manage Industrial Machine and Portable Power Tool Safety"
20. (QUESTION C3a(1)b) Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)"
21. (QUESTION C3a(1)a) Corporate Procedure: ESH100.2.IS.2, "Control Hazardous Energy (Lockout/Tagout)"
22. (QUESTION 6b) Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment"

23. (QUESTION C2) Corporate Procedure: ESH100.2.IS.8, "Assess Workplace Hazards and Provide and Maintain Personal Protective Equipment"
24. (QUESTION 5d(1)) Corporate Procedure: ESH100.2.PS.1, "Control Pressure Safety Hazards"
25. (QUESTION 10c) MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
26. (QUESTION 10a) MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
27. (QUESTION 10b) MN471000, Pressure Safety Manual, Chapter 2, "The Pressure Safety Program"
28. (QUESTION 10f) MN471000, Pressure Safety Manual, Chapter 6, "Testing and Evaluating Pressure Systems"
29. (QUESTION 10f) MN471000, Pressure Safety Manual, Chapter 7, "Verifying the Safe Operation of Pressure Systems"
30. (QUESTION 10f) MN471000, Pressure Safety Manual, Chapter 8, "Servicing Pressure Vessels and Components"
31. (QUESTION 10d) MN471000, Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems"
32. (QUESTION 10e) MN471000, Pressure Safety Manual, Chapter 9, "Documenting the Operational Safety of Pressure Systems"
33. (QUESTION 6b(2)) MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment"
34. (QUESTION 6b) MN471004, Electrical Safety Manual, Section 2.10, "Electrical Personal Protective Equipment"
35. (QUESTION 6a) MN471004, Electrical Safety Manual, Section 4.3, "Safe Work Practices"
36. (QUESTION 1) MN471016, Radiological Protection Procedures Manual, Chapter 1, "Radiological Work Planning and Controls"
37. (QUESTION 1) MN471016, Radiological Protection Procedures Manual, Chapter 3, "Radiological Training Program"
38. (QUESTION 1) MN471016, Radiological Protection Procedures Manual, Chapter 10, "Radiation Generating Devices"
39. (general corporate business process) Corporate Procedure: ESH100.2.ELC.1, "Manage Electrical Hazards"
40. (general corporate business process) Corporate Procedure: ESH100.2.GEN.3, "Develop and Use Technical Work Documents"
41. (general corporate business process) Corporate Procedure: ESH100.2.IS.7, "Implement Traffic Safety"
42. (general corporate business process) MN471018, Work Planning and Control Manual

VI. Related Documents

Permits

Document Title	Number	Type	End Date
CINT's Authority-to-Construct Permit No. 1725 Actual Date of Initial Start-up	No. 1725	Air	
Discharge of Wastewater at 518/All (CINT)	14-112	Water	03/13/2014

NEPA Documents

Document Title	Number	Project End Date
CINT Bldg. 518/1527 Installation and Operation of Atomic Layer Deposition (ALD) Reactor	SNA10-0098	03/15/2015
CINT Bldg. 518/1532 Installation and Operation of Low Pressure Chemical Vapor Deposition Furnace	SNA10-0201	03/11/2015
Routine Operation of CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)	NM13-0117	02/01/2018
CINT Integration Lab - Parts Clean Room (Bldg. 518/Rm. 1511) Continuing Ops	NM13-0328	09/23/2018

Other Documents

Document Title	Number	Type	Published Date
Environmental Assessment for CINT at SNL/NM	DOE/EA-1457	EA	03/01/2006
Operating Procedure for Toxic/Pyrophoric/Inert Gas Cylinders Change-Out	OP1100.189	OP	01/17/2008
Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories	SOP1100.001 Issue D	SOP	11/01/2010

VII. Primary Hazard Screening Worksheets

Interview Worksheet

Questions

Answers

1 **Radiation-Generating Devices (RGDs):** Is there a radiation-generating-device (RGD)? (Answer this question "no" if all RGDs are registered as in-storage status.) Yes

RGDs								
RGD Name	RGD #	RGD Class	RGD Type	Accl. Voltage	Com'l Available	Modified	Custodian	SNL/NM Owned
Dual Beam FIB/SEM	216	Exempt Shielded	Inherently Safe	30	Yes	No	Nogan,John	Yes
Location: Site: SSTP, Area: N/A, Building: N/A, Room: N/A Location Details: NE corner Comments: ----								

Questions

Answers

1a Unless exempt, is the RGD **registered** with the Device Control Program? Yes

1b Are there any of the following radiation- generating devices (RGDs)? operations? Place a check mark to the right of all that apply.

1b(1) Inherently safe Yes

1b(2) Certified cabinet No

1b(3) X-ray Diffraction or fluorescence analysis equipment No

1b(4) Other exempt-shielded RGD No

1b(5) X-ray generator or particle accelerator No

1b(6) Other shielded RGD No

1b(7) Portable or mobile radiography RGD not using a radioactive source No

1b(8) Fixed device with partial shielding No

1b(9) Portable analytical device with an open-beam configuration No

1b(10) Open Installation not in the preceding classes No

1b(11) Unattended Installations No

1b(12) Neutron Generator Operations No

1c Will anyone enter any of the following areas?

1c(1) Controlled Area (unescorted access to do radiological work) No

1c(2) Radiation Area No

1c(3) High Radiation Area No

1c(4) Very High Radiation Area No

1d Are routine exposures **above 100 mrem** per year likely? No

1e Could anyone who is not a member of the workforce be **exposed** by the operation? (this usually involves portable or mobile radiography operations). No

1f Will there be radiological work in a **foreign country** or territory? No

1g Will the activity involve an RGD owned or operated by a party other than SNL or SNL subcontractors? No

	Questions	Answers
1h	Is there an RGD or a facility for an RGD acquired, built, or modified on or after January 1, 1996-excluding those RGDs classified as inherently safe or a certified cabinet?	No
Notes: All the RGDs utilized in the integration laboratory are classified as inherently safe.		
1i	Will radiation monitoring instruments be used in this activity by Members of the Workforce other than qualified Radiological Control Technicians?	No
1j	Will scrap metal generated from the project or activity come from a radiological area?	No
1k	Does the operation involve a device capable of creating a radiological area? Note: By definition, radiological areas must be accessible to individuals - otherwise the area is not a radiological area.	No
2	Radioactive Materials: Is radioactive material present?	No
3	Explosives and Ammunition: Are any explosives or ammunition (i.e., Hazard Class 1 materials) including explosive waste managed, handled, processed, used, or stored?	No
4	Lasers: Do the activities covered by this PHS involve regulated laser activities? Please review the definition of regulated laser activities before answering this question.	No
5	Chemicals: Do the activities involve chemicals? (Review the Help Text before answering this question.)	Yes
5a	Has the Industrial Hygiene Program performed an exposure assessment of the current activities conducted on Sandia-controlled premises involving chemicals that are covered by this PHS?	No
5b	Do any of the activities include? - Hazardous waste cleanup operations (e.g., environmental restoration [ER] sites) - Treatment, storage, and disposal (TSD) facilities - Emergency response	No
5c	Will activities have, use, synthesize, or liberate unbound engineered nanoscale particles (UNP)?	Yes
5c(1)	Could anyone who is not a Member of the Workforce be exposed by the activities that have, use, synthesize, or liberate unbound engineered nanoscale particles (UNP)?	Yes
5d	Do the activities involve storage or utilization of simple asphyxiants in any quantity?	Yes
5d(1)	Do the activities involving asphyxiants require an exposure assessment? (Review the exposure assessment exemption criteria presented in the Help Text)	No
5e	Are the hazardous chemicals, hazardous substances, or hazardous waste involved in these activities considered injurious corrosive materials?	Yes
5e(1)	Do these activities involve the use of hydrofluoric acid?	Yes
5f	Do these activities involve the use of new chemicals (a substance which has not been listed on the TSCA Inventory List)?	No
5g	Do the activities involve the storage, dispensing, or use of flammable or combustible liquids?	Yes

	Questions	Answers
5h	Do the activities involve any of the following? - Flammable chemicals in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas (at STP) in any single container or manifolded series of containers - Equipment connected to a house system for flammable gases - Reactive chemicals in quantities greater than 1 liter of liquid, 100 g of solid, or 500 cubic feet of gas in any single container or manifolded series of containers - Oxidizers, other than nitric acid, in quantities greater than 5 liters of liquid, 1 kg of solid, or 500 cubic feet of gas in any single container or process	Yes
5h(1)	Is a flammable gas used for purposes other than comfort heating or non-process hot water (e.g., restroom use)?	Yes
5h(1)a	Could more than 1000 cubic feet of flammable gas be released from a single container, manifolded series of containers, or house gas system?	No
5i	Do the activities involve pyrophoric chemicals or metal powders in total quantities greater than 100g?	Yes
5j	Do the activities include a process that involves highly hazardous chemicals at or above twenty-five percent of the Process Safety Management standard threshold quantities, or are there flammable liquids or gases involved in a process with a quantity of greater than 2,500 pounds?	No
5k	Do activities use or store toxic gases/liquids/vapors in quantities greater than the de minimus quantities listed in the Help Text?	Yes
5k(1)	Do the activities use or store toxic gases/liquids/vapors in quantities equal to or greater than the threshold (total)quantities listed in the Help Text?	No
5l	Do the activities use or store hazardous chemicals in quantities equal to or greater than the Emergency Management screening threshold quantities? (Refer to Help Text to determine if quantities have been exceeded.)	No
6	Electrical: Do Members of the Workforce: - Operate or maintain electrically powered equipment at 50 Volts or greater for alternating current (AC) or direct current (DC), other than general office equipment or, - Have the potential to come into contact with live electrical sources at 50 Volts or greater, other than plugging/unplugging common 120 V wall sockets?	Yes
6a	Is there any electrical equipment that is not Nationally Recognized Testing Laboratory (NRTL), listed or that is not Sandia approved?	Yes
6b	Do Members of the Workforce (including non-electrical workers) enter the limited approach boundary of exposed, energized electrical equipment for any reason (including zero-energy verification)? Note: The limited approach boundary can be determined from the applicable tables located in the Help Text.	Yes
6b(1)	Could non-electrical Members of the Workforce enter into the limited approach boundary for any reason?	No
6b(2)	Is the limited approach boundary entered for the performance of zero energy verification?	Yes
6b(3)	Is the limited approach boundary entered to perform troubleshooting and diagnostic measurements, calibration, or visual inspections?	Yes

	Questions	Answers
6b(4)	Is the limited approach boundary entered to perform live electrical work, including circuit manipulations?	No
6c	Do equipment operations involve operating circuit breakers or disconnect switches, or installing/removing pin and sleeve type electrical connectors? (See Help Text for pin and sleeve examples)	No
6d	Does the line qualification process (es) require additional training or site specific training such as OJT?	Yes
7	<p>Mechanical: Does the facility or activity involve the use of any of the following tools, equipment or activities?</p> <ul style="list-style-type: none"> - machine shop equipment - portable power tools - powder-actuated tools - centrifuge operations - forklifts - motorized hand trucks - cranes/hoists, miscellaneous lifting devices, - industrial robots or industrial robotic systems - operate light or heavy earth-moving equipment - excavations/trenches - floor or wall penetrations - stored or kinetic mechanical energy that could cause an injury during normal working conditions 	Yes
7a	Do Members of the Workforce operate machine shop equipment?	No
7b	Do Members of the Workforce operate portable power tools?	Yes
7c	Do Members of the Workforce operate powder-actuated tools (also known as explosive-actuated fastening tools)?	No
7d	Does this facility or project activity use centrifuges?	No
7e	Are forklifts used in any operations?	No
7f	Are motorized hand trucks used in any operations?	No
7g	Are overhead cranes/hoists, mobile cranes, miscellaneous lifting devices, (shop or gantry crane), or rigging used in any operations?	No
7h	Are industrial robots or industrial robotic systems used in this project or activity?	No
7i	Do Members of the Workforce operate light or heavy earth moving equipment?	No
7j	<p>Do Members of the Workforce perform or come into close proximity to any of these activities:</p> <ul style="list-style-type: none"> - Excavations/Trenches - Floor and/or Wall Penetrations 	No
7k	Do activities involve stored or kinetic mechanical energy that could cause an injury under normal working conditions?	No
8	Nonionizing Radiation: At any time, do activities produce nonionizing radiation (NIR) (excluding lasers and the low-power emitters specifically exempted in the help text)?	Yes

	Questions	Answers
8a	Has the Industrial Hygiene Program performed an exposure assessment of the source(s) of nonionizing radiation on Sandia-controlled premises that are covered by this PHS?	Yes
Notes: See ALD Hazard Assessment Survey Report SNLNM02066.		
8a(1)	Based on the exposure assessment performed by the Industrial Hygiene Program, are nonionizing radiation sources capable of resulting in an exposure above the applicable exposure limits?	No
8b	Are any of the nonionizing radiation sources intentional emitters, (e.g., transmitters)?	No
9	Thermal: Do thermal hazards or thermal stressors exist in the work area? Please review the definition of thermal stressors before answering this question.	Yes
9a	Do thermal hazards exist in the work area in such a manner that Members of the Workforce may be exposed under normal conditions or in a foreseeable emergency?	Yes
9b	Do thermal stressors exist in the work area?	No
10	Pressure: Are Members of the Workforce involved in the design, installation, operation, or maintenance of a pressure system (including pressure, vacuum, cryogenic fluid applications)?	Yes

Pressure Hazards	
Source	Description
Ultra high vacuum systems	---- Location: none Location Details: --- Comments: ----

	Questions	Answers
10a	Do Members of the Workforce function as pressure system operators?	Yes
10b	Do Members of the Workforce function as pressure installers?	Yes
10c	Do Members of the Workforce handle cryogenic fluids, or design install or operate cryogenic fluid-handling systems?	Yes
10d	Do all systems meet the documentation requirements of the Pressure Safety Manual, Chapter 9? Note: Data packages on Pressure Safety Analysis Reports must reflect the current system configuration and personnel.	Yes
10e	Do supplier-established pressure ratings exist for all systems and system components?	Yes
10f	Are pressure system (or component) reevaluations being performed according to the requirements of the Pressure Safety Manual? (A common example would be the replacement or retesting of pressure relief valves.)	Yes
11	Noise: At any time, do sources of noise hazards exist during activities covered by this PHS?	No

	Questions	Answers
12	<p>Miscellaneous Hazards: Does the facility or activity involve any of the following hazards or activities?</p> <ul style="list-style-type: none"> - Ergonomic or musculoskeletal stressors - Construction-like activities - Work with and around asbestos - Elevated work - Underwater diving - Animals and hazardous plants - Aircraft - Airborne objects (other than aircraft) - Firearms - Use of human subjects - Use of sealed drum(s) 	No
13	<p>Outside of Manufacturer's Recommendations: Does this work involve the use of equipment, tools, or materials outside of their design specifications or outside of the manufacturer's recommendations? (See Help Text for examples). Please enter each item into the hazard table.</p>	No
14	<p>Noncommercial Equipment: Does this work involve the use of noncommercial equipment or apparatus (excluding robots, robotics systems, and equipment where the only hazard is a pressure system that has a pressure safety data package)? Please enter each noncommercial piece of equipment into the hazard table.</p>	No
15	<p>Environmental Concerns: Are there any potential environmental concerns with this activity that align with the Sandia National Laboratories (SNL) Environmental Management System (EMS) aspects, such as chemical use, fuel or oil storage, waste generation (except sanitary trash), construction activities, outdoor test activities, disturbance to habitat or protected species, or discharges to the air, ground surface, ground water, or the sewer systems?</p>	Yes

Notes: This facility will generate less than 100 kg/month of hazardous waste.

Environmental Concerns Hazards		
Source	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: ----	
Hazardous Waste	liquid and solid	<100 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: The labs will generate small quantities of hazardous waste including organic solvents, acids, and bases.	
Water from acid neutralizer	Water	100 gal/day
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: There will be water discharged to the sanitary sewer from the acid neutralizer system.	

	Questions	Answers
15a	Wastewater: Are there any wastewater discharges from this activity?	Yes
15b	Air: Are there any air discharges or emissions at this activity?	Yes
15b(1)	Ozone Depleting Substance (ODS): Are there any ODSs at this activity?	No
15b(2)	Will this activity include the installation and or use of combustion equipment ? (Combustion equipment includes boilers and internal combustion engines, such as generators.)	No
15b(3)	Will this activity involve open-burn activities?	No
15b(4)	Will this activity involve soil disturbance, building demolition, or construction that disturbs soil , including access roads and staging areas?	No
15b(5)	Radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAP): Are there any radionuclide air discharges or use of radionuclides in gaseous form or at elevated temperatures from this activity?	No
15c	Radioactive Waste: Will this activity generate any radioactive waste, or will Members of the Workforce be required to handle radioactive waste?	No
15d	Hazardous Waste: Will this activity generate any hazardous waste, or will Members of the Workforce be required to handle hazardous waste?	Yes
15d(1)	Hazardous Waste Accumulation Area: Will this activity have the potential to accumulate greater than 55 gallons of any hazardous waste at any one given time?	No
15d(2)	Acutely Hazardous Waste: Will this activity generate any acutely hazardous waste ?	No
15e	Mixed Waste: Will this activity generate any mixed waste , or will Members of the Workforce be required to manage mixed waste?	No
15f	Infectious / Biohazardous Waste: Will this activity generate any infectious or biohazardous waste, or will Members of the Workforce be required to handle infectious or biohazardous waste?	No
15g	Material or Waste of Unknown Origin: Will this activity require handling material or waste of unknown origin?	No
15h	Fuels or Oil Storage: Does this activity use a fuel or oil storage container capable of containing 55 gallons or more?	No
15i	Discharges to Ground Surface: Does this activity have discharges (liquid or solid) to the ground surface ? Note: Discharges are commonly associated with outdoor testing and maintenance activities.	No
15j	Improvements/modifications to structure/building exteriors and landscaping: Will this project involve activities that require modifications to the exteriors of structures and buildings or modification to existing landscape, including removal of vegetation?	No
15k	Disturbance to habitat or protected species: Will this project involve activities that will disturb habitat or protected species, including wildlife management and outdoor projects or testing activities?	No
16	Movement of Hazardous Material: Will any activities covered by this PHS involve the movement of hazardous material (including explosives or radioactive material) outside of a building using motorized equipment?	No

	Questions	Answers
17	<p>Fire Protection Concerns: Will the activity include any of the following?</p> <ul style="list-style-type: none"> - Members of the Workforce modifying in any way any fire suppression or life safety system (fire rated walls, fire doors, fire sprinklers, fire alarm devices, fire extinguishers, or means of egress). - Members of the Workforce performing hot work in association with this facility or project activity. (Please note that soldering is considered hot work). 	No
18	<p>Biological Agents: Do activities involve the use of or potential exposure to biological agents? (see Help Text before answering this question.)</p>	No
19	<p>Confined Spaces: Are confined spaces present in the work area?</p>	No
20	<p>Beryllium: Do operations include any activities that? (Review the Help Text before answering this question)</p> <ul style="list-style-type: none"> - Use or handle beryllium, beryllium-containing alloys or beryllium oxides? - Create or work with beryllium ceramics? - Handle waste potentially-contaminated with beryllium or waste containing beryllium? - Perform decontamination of beryllium contamination? - Entail work in a beryllium contaminated building or area? - Apply abrasive or destructive methods to metal objects, articles, weapon components or bar stock, potentially containing beryllium? - Use non sparking tools containing beryllium? 	No
21	<p>Offsite Locations: Does this PHS include work at locations other than KAFB, SNL/CA, NTS, or TTR regardless of whether or not the worksite is on Sandia-controlled Premises?</p>	Yes

	Questions	Answers
21a	<p>Does work performed by Members of the Workforce at locations other than KAFB, SNL/CA, NTS, or TTR involve any of the following (as defined in the listed PHS questions)? In the question notes, please identify which of the hazards drive a "yes" answer to this question and include approximately a sentence for each identified hazard, describing how it is used or produced.</p> <ul style="list-style-type: none"> - Radiation-generating devices (see question 1) - Radioactive materials (see question 2) - Explosives (see question 3) - Lasers in navigable air space or affecting other operations (see question 4b) - HAZWOPER operations (see question 5b) - Unbound engineered nanoparticles (see question 5c) - Newly developed chemical substance (see question 5f) - Chemical physical hazards (see question 5h) - Pyrophorics or metal powders >100g (see question 5i) - >25% PSM quantities (see question 5j) - Toxic gases (see question 5k) - >Emergency Management screening quantities (see question 5l) - Personnel overexposure to nonionizing radiation (see question 8a(1)) - Public overexposure to nonionizing radiation (see question 8b(1)) - Non-routine aircraft (see question 12g(1)) - Airborne objects other than aircraft (e.g., projectiles, fragments) (see question 12h) - Firearms (see question 12i) - Equipment used outside of manufacturer's recommendations with the potential to cause injury to co-located workers or public (see question 13b) - Non-commercial equipment with the potential to cause injury to co-located workers or public (see question 14b) - Biological agents BSL-2 or higher 	Yes

Questions

Answers

Notes: Toxic gasses are used in bays 1512, 1527 and 1532. Bay 1512 will include 15g of phosphene for an Atomic Precision Fabrication Tool. Bay 1527 includes Boron Trichloride, Chlorine, Ammonia, Titanium Tetrachloride, plus TMA and TDMAH precursors for Etch, Chemical Vapor Deposition and Atomic Layer Deposition. In bay 1532, toxic gasses include ammonia and dichlorosilane for Low Pressure Chemical Vapor Deposition.

21a(1)	Has the SNL Safety Basis Department determined a hazard classification for these activities?	Yes
21a(1)a	What hazard classification was determined by the SNL Safety Basis Department?	Low
21b	Do these activities involve foreign travel?	No
22	Roving: Will any Member of the Workforce enter into non-office work areas with operations controlled by others while conducting activities covered by this PHS? Include all work activities meeting these criteria, including research. Do not include personnel from other organizations, whose work is not covered by this PHS, who enter your workspace (e.g., custodial personnel)?	Yes
22a	Do the entries include non-office work areas on Sandia-controlled premises?	No
22b	Do the entries include work areas on non-Sandia-controlled premises?	No
23	Emergency Response: Do activities include emergency response operations (e.g., confined space rescue, hazardous materials response, emergency medical services, natural disaster, Radiological Assistance Program, Accident Response Group, Joint Tactical Operations Team, Nuclear Emergency Search Team)?	No
24	Off-Hour Activities: Could Members of the Workforce conduct activities covered by this PHS outside the hours of 0700 to 1700 or on weekends/holidays? Note: These are the hours without full emergency response or medical coverage at SNL/NM.	Yes
24a	Will the need to perform work off-hours present increased risks or additional hazards that would necessitate implementation of additional controls? Note: Include increased risks and hazards from the work being performed, personnel working alone, decreased emergency response support, general work area hazards, potential loss of utilities, and natural phenomena.	No
24b	Could off-hour activities require emergency response support beyond the normal off-hours support listed in the help text? If "yes," describe the applicable activities in the note for this question.	No
25	Other Hazards: Do the activities have important hazards not specifically identified elsewhere in this PHS?	No

Controls Worksheet

	Questions	Answers
C1	Local Exhaust Ventilation: Do the activities covered by this PHS use local exhaust ventilation (LEV) on Sandia-controlled premises (e.g., laboratory hoods, glove boxes, downdraft tables, "elephant trunks," canopy hoods, paint booths, slot ventilation, portable welding ventilation, etc.)?	Yes
C2	Personal Protective Equipment (PPE): Are hazards (e.g., chemicals radiological, electrical, mechanical, thermal, flying particles and/or falling or rolling objects) encountered that are capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact?	Yes
C2a	Has a workplace hazard assessment been performed for these activities on Sandia-controlled premises?	Yes
C2a(1)	Did the workplace hazard assessment determine that PPE will be required?	Yes
C2a(1)a	Did the workplace hazard assessment determine that hard hats, safety glasses, face shields, safety shoes and/or gloves are required for mechanical hazards and have not been covered by other task/site specific training?	Yes
C2a(1)b	Has the workplace hazard assessment determined respiratory protection is required?	Yes
C3	Hazardous Energy Control: (including but not limited to: electrical, pressure, pneumatic, mechanical, cryogenic, chemical, fire, radiation, laser, gravity, high temperature). Do you have any equipment in your operations that requires any of the following service and maintenance activities?	Yes
	<ul style="list-style-type: none"> - Construction - Installation - Setup - Adjustment - Inspection - Modification - Maintenance - Service - Lubrication - Cleaning - Un-jamming - Making adjustments or tool changes 	
C3a	While performing any of the servicing and maintenance activities listed above, is there potential for injury from the unexpected energization or start up of the machines, equipment, or process, or from a release of stored energy?	Yes
Notes: Individuals performing these tasks have completed the appropriate training for Lockout/Tagout.		
C3a(1)	Will service or maintenance be done on a machine, equipment, or a process by Members of the Workforce within your organization?	Yes
C3a(1)a	Will all service or maintenance be done on a machine, equipment, or a process by Members of the Workforce within your organization ?	No
C3a(1)b	During the service or maintenance can all the equipment be controlled by cord and plug?	No

	Questions	Answers
C3a(1)c	Have periodic inspections of hazardous energy control (lockout/tagout) procedures and LOTO authorized workers been completed for all workers and procedures, as required?	Yes
C3b	Are there any activities where control of hazardous energy sources is only necessary for protection of configuration, equipment, or property (i.e., not for personnel protection)?	No
C4	NEPA Compliance: Has this project or activity been reviewed for National Environmental Policy Act (NEPA) compliance in the ISMS NEPA Module? Note: NEPA Checklists should be amended at least every five years.	Yes
C4a	Are all relevant NEPA documents listed in the Documents section of this PHS?	Yes
C5	Activity-Level PHS: Will this PHS be used as an Activity-level PHS, in lieu of a Job Safety Analysis (JSA), for low rigor work?	No

VIII. Hazard Analysis (HA) Section

Hazard Analysis

Source Name or Question: QUESTION 5a

Source Reason: Unevaluated chemical use
--

Hazardous Condition: Potential chemical overexposure

PHS Identified 'Low' Hazard.**Author's Comment:****Cause:** Human Error

Personnel do not use chemicals in designated space (i.e. wet bench/fume hood)

Consequence: Major Illness/Injury

Personnel could become exposed to chemicals being used if not in a well ventilated proper LEV system.

Mitigation: Active Engineering Control-Air Flow Control System

It is a requirement for personnel to use chemicals in a wet bench or fume hood during use.

Mitigation: Procedural/TWD (SOP/OP/RWP)-Other**Document Id:** SOP1100.001 Issue D, **Title:** Standard Operating Procedure for Working with Hazardous and Particularly Hazardous Chemicals in Center 1100 Laboratories

The SOP provides information on the use of chemicals including the hazards and controls.

Mitigation: Training-Other**Course Id:** LAB100, **Title:** LABORATORY STANDARD INFORMATION AND TRAINING

All personnel with access to the clean room are required to complete this course.

Mitigation: Training-Other**Course Id:** LAB103, **Title:** SITE-SPECIFIC LABORATORY SAFETY TRAINING

All personnel with access to the clean room are required to complete this course.

Mitigation: Training-Other

ILUA - Integration Lab Unescorted Access training is provided to all personnel working in the clean room. This training is supplemental to the LAB100 and LAB103 providing training on specific activities.

Mitigation: Procedural/TWD (SOP/OP/RWP)-Other

An SWP has been written which also addresses the hazards and controls when working with chemicals. This will be reviewed by IH.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: The active engineering control, procedures and training are deemed adequate for these chemical operations.

Source Name or Question: QUESTION 5h(1)a
Source Reason: Use or storage of flammable gasses
Hazardous Condition: Fire or explosion

PHS Identified 'Low' Hazard.

Author's Comment: The gases of concern are Silane (8 lbs) and Dichlorosilane (8 lbs). All are contained within gas cabinets are designed to shut down upon detection of any leaks. Metal organic and metal halide precursors in less than 100g quantities are contained in an exhausted equipment enclosure. Sources are automatically isolated in the event that a leak is detected.

Cause: System/Component/Equipment Failure

An equipment failure may lead to release of flammable gasses, such as oxygen, or pyrophoric gasses, such as disilane.

Consequence: Death [Worker]

Accidental release of flammable and/or pyrophoric gasses may lead death in an explosion and fire.

Mitigation: Active Engineering Control-Fire Suppression System

The IL fire alarm and suppression system, in conjunction with the Toxic Gas Monitoring System (TGMS) is effective in detecting leaks, battling small fires, and alerting users to an emergency that requires evacuation of the facility.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: The TGMS and fire alarm and suppression systems are adequate to protect the safety of persons and property in the event of a fire or explosion.

Source Name or Question: QUESTION 21a(1)a
Source Reason: Low-Level Offsite Hazardous Work Condition
Hazardous Condition: Potential for worker exposure

PHS Identified 'Low' Hazard.

Author's Comment:

Cause: System/Component/Equipment Failure

Frayed wire.

Consequence: Minor Illness/Injury

Electric shock.

Mitigation: Supervised Activity-Other

Ensure that instrument is unplugged before servicing.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Meets LOTO requirements.

Cause: Human Error

Direct contact with hazardous chemicals

Consequence: Minor Illness/Injury

Direct contact with any number of hazardous chemicals utilized in the lab.

Mitigation: Supervised Activity-Other

Do not allow individual to work with hazardous chemicals without completing the necessary training requirements.

Mitigation: Active Engineering Control-Other

Wear appropriate PPE which includes safety glasses when working near hazardous chemicals.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Follows practices outlined in the Division 1100 chemical handling OP and in tool specific OPs.

Source Name or Question: QUESTION 6a
Source Reason: Electrical equipment operating at 50V or greater that is not NRTL-approved
Hazardous Condition: Electrocution/Arcs/Fires

PHS Identified 'Low' Hazard.

Author's Comment:

Cause: System/Component/Equipment Failure

Electrical component failure.

Consequence: Minor Mission Disruption/Delay

Failed components may to be ordered and replaced.

Mitigation: Unspecified Control-Other

Maintain a reasonable inventory of common high failure spare parts such as fuses, etc.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Proper spare parts support a quick recovery.

Source Name or Question: QUESTION 5k(1)
Source Reason: Toxic gases/liquids/vapors
Hazardous Condition: Inhalation / Potential for environmental release

PHS Identified 'Low' Hazard.**Author's Comment:**

Cause: Human Error

Insufficient purging of cylinder connection.

Consequence: Negligible ES&H Impact

Release of small quantity of chemical into exhausted gas cabinet.

Mitigation: Active Engineering Control-Air Flow Control System

Cabinet is operated at a face velocity of 100 fpm when the door is opened. All cabinets are covered by Sandia's LEV program. Refugee chemicals are introduced into the lab's acid exhaust system where they are mixed with a 10,000 cfm control air flow stream and directed out the stack. quantities released would be insignificant.

Mitigation: Personal Protective Equipment-Other

Personnel performing bottle changes involving hazardous gasses wear either an SCBA or air purifying respirator. Requirements for respiratory protection are outlined in the Industrial Hygiene Exposure Assessment for the given hazards and area.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Activities follow standard practices outlined by Sandia IH to protect the worker from accidental inhalation. Environmental effects associated with the release of a particular substance into the environment were analyzed and approved by the appropriate compliance monitoring authorities at Sandia.

Source Name or Question: QUESTION 5c(1)
Source Reason: Unbound Engineered Nanoscale Particles (UNP)
Hazardous Condition: Potential inhalation and dermal exposure to Unbound Engineered Nanoscale Particles(UNP)

PHS Identified 'Low' Hazard.**Author's Comment:**

Cause: Natural Phenomenon

UNP is suspended in a solvent solution and then drop cast to a surface as a part of the process. The solvent dries and not all NP are bound to the surface by van der Waals forces. Material could become airborne of land on surfaces outside of the intended area.

Consequence: Negligible ES&H Impact

Exact impact of direct exposure to these materials is not clearly understood.

Mitigation: Active Engineering Control-Air Flow Control System

UNP must be handled within the work space of a ventilated hood. In the event that the material becomes airborne, it is anticipated that the hazard would be pulled away from the worker reducing the risk of exposure.

Mitigation: Procedural (Monitoring etc.)-Other

Industrial Hygiene Exposure Assessment covers UNP handling and transfer as one of the activities surveyed.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: The long term risks of handling UNP are not clear, however these mitigations are incorporated under the guidance of Sandia subject matter experts and the Industrial Hygienist.

Cause: Human Error

While working in ventilation hood, vial containing nanomaterials spills on top of bench.

Consequence: Minor Environmental Impact

Nanomaterials are collected and disposed of in the appropriate hazardous waste receptacle.

Mitigation: Unspecified Control-Other

Sandia's Waste Disposal and Description Request process for disposal of hazardous waste.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Sandia's WDDR process allows the hazardous waste to be disposed of in an environmentally friendly manner.

Consequence: Negligible ES&H Impact

Small portions of nanomaterials may become unbound as carrier solvent evaporates.

Mitigation: Active Engineering Control-Air Flow Control System

Nano particles are swept away from the the workspace protecting worker.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Workspaces where nanomaterials are handled, follow Sandia's LEV program to ensure that ventilation meets minimum safety standards as identified by Sandia EH&S and IH guidance.

Source Name or Question: QUESTION 5i
Source Reason: Quantities greater than 100g
Hazardous Condition: Increased hazards from fires, reactions, and explosions.

PHS Identified 'Low' Hazard.

Author's Comment:

Cause: System/Component/Equipment Failure

Chemical breach of primary containment.

Consequence: Minor Mission Disruption/Delay

Component replacement, chemical/container contaminated with air.

Mitigation: Active Engineering Control-Other

Toxic gas monitoring hardware for smoke and chemical vapor integrated into secondary containment enclosure is designed to shut off the source in the event of a leak.

Author Assessment of Adequacy: Applied Mitigation and Prevention are sufficient.

Adequacy Explanation: Control of substance follow industry standards and methodologies currently employed throughout the lab.

Note: 24 hazard analysis(es) were not reported, because no (optional) hazard analysis was performed for them.

IX. Supplemental Information

PHS Input

Notes from Interview Questions

- Q 1h - All the RGDs utilized in the integration laboratory are classified as inherently safe.
- Q 8a - See ALD Hazard Assessment Survey Report SNLNM02066.
- Q 15 - This facility will generate less than 100 kg/month of hazardous waste.
- Q 21a - Toxic gasses are used in bays 1512, 1527 and 1532. Bay 1512 will include 15g of phosphene for an Atomic Precision Fabrication Tool. Bay 1527 includes Boron Trichloride, Chlorine, Ammonia, Titanium Tetrachloride, plus TMA and TDMAH precursors for Etch, Chemical Vapor Deposition and Atomic Layer Deposition. In bay 1532, toxic gasses include ammonia and dichlorosilane for Low Pressure Chemical Vapor Deposition.

Notes from Controls Questions

- Q C3a - Individuals performing these tasks have completed the appropriate training for Lockout/Tagout.

User Entered Hazard Tables

RGDs								
RGD Name	RGD #	RGD Class	RGD Type	Accl. Voltage	Com'l Available	Modified	Custodian	SNL/NM Owned
Dual Beam FIB/SEM	216	Exempt Shielded	Inherently Safe	30	Yes	No	Nogan,John	Yes
Location: Site: SSTP, Area: N/A, Building: N/A, Room: N/A Location Details: NE corner Comments: ----								

Pressure Hazards	
Source	Description
Ultra high vacuum systems	---- Location: none Location Details: --- Comments: ----

Environmental Concerns Hazards		
Source	Type	Est. Quantity
Evaporated organic solvents	air	100 l/yr
Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: ----		

Environmental Concerns Hazards		
Source	Type	Est. Quantity
Hazardous Waste	liquid and solid	<100 kg/mo
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: The labs will generate small quantities of hazardous waste including organic solvents, acids, and bases.	
Water from acid neutralizer	Water	100 gal/day
	Location: Site: SSTP, Area: No Tech Area, Building: 518, Room: N/A Location Details: --- Comments: There will be water discharged to the sanitary sewer from the acid neutralizer system.	

Assigned Reviewers

Review Type	Role	Person	Required/Requested
Technical SME	Industrial Facility Safety Basis SME	Curran,Kelsey Leigh Forde	Required review by business rule.
	Required Assignment: Review Question 5c(1) for classification of UNP use		
	Required Assignment: Review Question 5i for classification of pyrophoric chemical or metal powder use		
	Required Assignment: Review Question 21 and hazard-specific question sets that relate to the user-specified hazards identified in Question 21		
	Comment: [klfc/tss 08222014] IFSB review of Q21a for MOW performing hazardous activities at non-Sandia controlled locations as offsite CINT location with following listed hazards: RGD (exempt shielded/inherently safe), UNP, chemical physical hazards, reactive chemicals (metal powders/pyrophorics), and toxic materials. Required completion of stand alone HA to verify facility hazard classification prior to next PHS review.		
ES&H Coordinator	ES&H Coordinator	Nelson,John Seth	Required review by business rule.
	Comment:		
Safety Basis	PHS Team	Hall,Christopher Armando	Required review by business rule.
	Comment: Reviewed and concur		
Manager	Line Manager	Shinn,Neal D.	Required review by business rule.
	Comment:		

PHS Output

Major Safety Concerns

The hazard classification is: Low

The required documentation is: A PHS with Integral HA is required

Safety Concerns at this Low level include:

(QUESTION 5a) Potential chemical overexposure

(QUESTION 5c(1)) Potential inhalation and dermal exposure

(QUESTION 5h(1)a) Potential fire and explosion

(QUESTION 5i) Increased hazards from fires, reactions, and explosions.

(QUESTION 5k(1)) Potential exposure to toxic gases/liquids/vapors in the event of a release

(QUESTION 6a) Unknown hazard potential since items have not gone through the standards, testing rigor, and hazard analysis associated with an NRTL-evaluation

(QUESTION 21a(1)a) Hazards from work conducted offsite by Members of the Workforce

Other Safety Concerns

Other Safety Concerns (potential hazard sources) for this: Facility or Lab

(QUESTION 1) Potential for minor injury or illness

(QUESTION 1b(1)) Potential for minor injury or illness

(QUESTION 5) Potential personnel exposure to chemicals & fire protection regulatory requirements

(QUESTION 5c) Unbound Engineered Nanoscale Particles(UNP); Potential inhalation and dermal exposure to UNP.

(QUESTION 5d(1)) Asphyxiant gas is present

(QUESTION 5e) Corrosive chemical; Potential exposure to skin and eyes.

(QUESTION 5e(1)) Potential exposure to skin and eyes

(QUESTION 5g) Fire/Explosion Hazard

(QUESTION 5h) Hazards from fires, reactions, and explosions

(QUESTION 6) Potential for electrical shock

(QUESTION 6b) Potential electrical shock or arc

(QUESTION 6b(2)) Potential electrical shock or arc flash

(QUESTION 6b(3)) Potential electrical shock or arc flash

(QUESTION 7) Potential injury from mechanical forces

(QUESTION 7b) Potential injury from portable power tools

(QUESTION 8a) Potential exposure to nonionizing radiation.

(QUESTION 8a(1)) Potential exposure to nonionizing radiation below exposure limits.

(QUESTION 9a) Contact with hot or cold objects

(QUESTION 10) Injury or damage

(QUESTION 15) Potential for regulatory action

(QUESTION 15a) Potential to exceed permitted quantities

(QUESTION 15b) Potential to emit regulated contaminants

(QUESTION 15d) Potential for regulatory action

(QUESTION C3) Potential injury to personnel from exposure to hazardous energy

PHS Identified Training, by Source

[Note: This training is a regulatory requirement for one or more people involved in operations associated with identified hazards. Each class may not be required by all people working in the area. Please note that some training classes are only provided occasionally. Please be sure to allow adequate lead-time for personnel to schedule and complete training.]

CHM100: CHEMICAL SAFETY TRAINING ()

CHM103: SITE-SPECIFIC CHEMICAL SAFETY TRAINING ()

ELC200: ELECTRICAL SAFETY FOR ELECTRICAL WORKERS ()

ELC200: ELECTRICAL SAFETY FOR ELECTRICAL WORKERS ()

ENV112: HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT TRAINING ()

ESH100: ES&H AWARENESS ()

ESH200: SAFETY MANAGEMENT ()

LTO210: LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS ()

LTO210: LOCKOUT/TAGOUT FOR AUTHORIZED WORKERS ()

MCH200: HAND AND POWER TOOL SAFETY ()

MED105HF: HYDROFLUORIC ACID SAFETY ()

NANO101: NANOTECHNOLOGY SAFETY AWARENESS TRAINING ()

PPE106: PERSONAL PROTECTIVE EQUIPMENT TRAINING ()

PRS115: CRYOGEN SAFETY ()

PRS115R: CRYOGEN SAFETY REFRESHER ()

PRS150: PRESSURE SAFETY ORIENTATION ()

PRS150: PRESSURE SAFETY ORIENTATION ()

PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER ()

PRS150R: PRESSURE SAFETY ORIENTATION REFRESHER ()

PRS250: ADVANCED PRESSURE SAFETY ()

PRS250R: PRESSURE SAFETY ORIENTATION REFRESHER ()

RAD102: GENERAL EMPLOYEE RADIOLOGICAL TRAINING ()

RAD219: RADIATION-GENERATING DEVICE CUSTODIAN TRAINING ()

RAD250: MANAGEMENT OF RADIOLOGICAL OPERATIONS ()

RSP215: AIR-PURIFYING RESPIRATORY PROTECTION ()

RSP217: COMPREHENSIVE RESPIRATORY PROTECTION ()

RSP230: RESPIRATORY PROTECTION FOR SUPERVISORS ()

Results Based on Answers and User-Entered Hazards

The results in this PHS were based on the following answers to interview questions and user-entered hazards:

Q 0 answered: Y; Q 1 answered: Y; Q 1a answered: Y; Q 1b(1) answered: Y; Q 5 answered: Y;
Q 5a answered: N; Q 5c answered: Y; Q 5c(1) answered: Y; Q 5d(1) answered: N; Q 5e answered: Y;
Q 5e(1) answered: Y; Q 5g answered: Y; Q 5h answered: Y; Q 5h(1)a answered: N; Q 5i answered: Y;
Q 5k(1) answered: N; Q 6 answered: Y; Q 6a answered: Y; Q 6b answered: Y; Q 6b(2) answered: Y;
Q 6b(3) answered: Y; Q 6d answered: Y; Q 7 answered: Y; Q 7b answered: Y; Q 8 answered: Y;
Q 8a answered: Y; Q 8a(1) answered: N; Q 9a answered: Y; Q 10 answered: Y; Q 10a answered: Y;
Q 10b answered: Y; Q 10c answered: Y; Q 10d answered: Y; Q 10e answered: Y; Q 10f answered: Y;
Q 15 answered: Y; Q 15a answered: Y; Q 15b answered: Y; Q 15d answered: Y; Q 21a(1) answered: Y;
Q 21a(1)a answered: Low; Q C1 answered: Y; Q C2 answered: Y; Q C2a(1)a answered: Y; Q C2a(1)b answered: Y;
Q C3 answered: Y; Q C3a(1)a answered: N; Q C3a(1)b answered: N; Q C3a(1)c answered: Y; Q C4 answered: Y;